THE RAILWAY GAZETTE
A Journal of Management, Engineering and Operation
INCORPORATING
Railway Engineer · TRANSPORT · The Railway News
The Railway Times · Herapath's Railway Journal ESTABLISHED 1835 · RAILWAY RECORD.
RAILWAYS ILLUSTRATED · THE RAILWAY OFFICIAL GAZETTE

PUBLISHED EVERY FRIDAY
AT
33, TOTHILL STREET, WESTMINSTER, LONDON, S.W.1

Telegraphic Address: "TRAZETTE PARL., LONDON"
Telephone No.: WHITEHALL 9233 (6 lines)

Annual subscription payable in advance and postage free
British Isles and Abroad.....£2 5s. 0d.
Single Copies.....One Shilling
Registered at the General Post Office, London, as a Newspaper

VOL. 64. No. 4 FRIDAY, JANUARY 24, 1936

CONTENTS

	PAGE
Editorials	133
Letters to the Editor	138
Publications Received	139
The Scrap Heap	140
Overseas Railway Affairs	141
The Varied Responsibilities of an Electrical Engineer	143
New 80-ton Cranes at Lahore	144
New Marshalling Yard at Hull, L.N.E.R.	145
New 0-10-0 type Locomotives, Lithuanian Railways	153
British Freight Rolling Stock	158
A New Horizontal Spring Scragging Machine	154
New First Class Kitchen-Dining Cars, L.M.S.R.	157
Railways News Section	159
Personal	159
Official Notices	171
Railway Share Market	172

DIESEL RAILWAY TRACTION

A Supplement illustrating and describing developments in Diesel Railway Traction is presented with each copy of this week's issue.

KING GEORGE V

"IT is with great sorrow that we make the following announcement. His Majesty the King passed peacefully away at a few minutes before twelve." This was the message broadcast at 12.15 on Tuesday morning, January 21, which told the world—for the first time by radio—of the death of a British sovereign. Throughout his reign King George V understood his people and identified himself with their interests, and they responded with a deep and respectful affection which was displayed to the full in the anxious times of his earlier and last illnesses, and perhaps most of all in the enthusiastic Jubilee celebrations of last year. His was a reign overshadowed by many a crisis before, during, and after the war, but a reign also marked by tremendous industrial development in which the King always showed a keen practical interest. On July 22, 1912, he opened the great new dock (The King's Dock) at Immingham, and that occasion is also memorable for the last conferring of a knighthood in public before a large gathering, when Sir Sam Fay received that honour. The King George Dock, Hull (previously known as the Hull Joint Dock), was opened by the King on June 26, 1914, and as recently as July 26, 1933, he opened at Southampton the King George Graving Dock, the largest in the world, and the only one capable of accommodating the ss. *Queen Mary*. These are all railway-owned docks, but a more direct contact with railways was shown on April 28, 1924, when he visited the Swindon works of the Great Western Railway and himself drove an engine there. He was titular head of State railways throughout India, his Dominions, and Colonies, totalling approximately 104,000 route miles. Exactly fifty years before his death he was present, as Prince George, at the opening of the Mersey Railway—on January 20, 1886. Another Mersey tunnel, the great new road tunnel, was formally opened by him in 1934. During the quarter of the century covered by the reign of King George V, transport developments have been mainly in directions other than railway. Motorcars and motorbuses were in their infancy when he came to the throne, and aeroplanes, though actually in existence, were not then of practical use.

The Week's Traffics

Coal again provides the largest part of the net increase of £61,000 in the traffics of the four group companies for the past week, and accounts for £52,500 of that increase. Merchandise takings for the week show a net advance of £19,500, but there is a net fall of £11,000 in passenger train receipts. Aggregate traffics of the four companies to date amount to £8,023,000, an increase of £270,000 or 3·48 per cent. The merchandise traffics of the L.M.S.R. and the L.N.E.R. continue satisfactory, the increase to date in the former case being £38,000 or 3·05 per cent., and in the latter £31,000 or 3·46 per cent. In coal traffic the L.M.S.R. increase is £79,000 or 10·15 per cent., that of the L.N.E.R. is £54,000 or 7·55 per cent.; the Great Western has an increase of £35,000 or 10·74 per cent., and the Southern one of £11,500 or 11·5 per cent.

	3rd Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R.	− 4,000	+ 8,000	+ 15,000	+ 19,000	+ 126,000	+ 4·06
L.N.E.R.	+ 2,000	+ 12,000	+ 22,000	+ 36,000	+ 102,000	+ 4·35
G.W.R.	− 6,000	+ 1,000	+ 12,000	+ 7,000	+ 30,000	+ 2·27
S.R.	− 3,000	− 1,500	+ 3,500	− 1,000	+ 12,000	+ 1·22

London Transport receipts for the 29 weeks to date are £15,790,800, an increase of £240,600.

* * * *

Nine Months' Goods Train Traffics

Freight train receipts of standard gauge railways in Great Britain for the 40 weeks ended October 5, 1935, were, as shown in the analysis published with the Ministry of Transport statistics for the month of September last, £64,636,876, a decrease of £345,007 or 0·53 per cent. in comparison with the corresponding period in 1934. Higher class merchandise, with receipts of £30,142,366, showed a gain of £46,762 or 0·16 per cent., notwithstanding a tonnage lower by 448,346 or 1·25 per cent. Of minerals and merchandise (Classes 1-6) 38,305,599 tons were carried, a decrease of 439,231 tons or 1·13 per cent., with receipts of £10,085,960, which were lower by £70,767 or 0·70 per cent. Coal, coke, and patent fuel brought in receipts of £23,489,211, a decrease of £340,254 or 1·43 per cent., earned from 129,350,353 tons, which were fewer by 1,686,178 or 1·29 per cent. During the 12 weeks ended October 5 higher class merchandise appears to have had a decrease of 182,095 tons and of £154,043, whereas minerals and merchandise (Classes 1-6) with a tonnage 203,523 lower secured receipts £15,125 higher. Receipts from coal, coke, and patent fuel decreased by £132,266.

Bengal & North Western Railway

Gross earnings from the 1,306 miles of metre-gauge line of the Bengal & North Western Railway Company and from the 798 miles of Tirhut State Railway which the company works showed in the year ended September 30, 1935 an increase of Rs. 16,27,187 over the previous year. Working expenses were Rs. 14,18,106 higher, and net earnings improved by Rs. 2,09,171. The increase of 2,474,827 in the number of passengers was mainly in the third class, and the principal increases in goods tonnage were under coal and coke and tobacco, against decreases in rice and grain and pulses. Maintenance of way, works and stations cost Rs. 5,14,455 more, owing to heavier expenditure on earthquake damage repairs and relaying of lines. Renewal of engines and carriage of coal accounted for the rise of Rs. 5,96,188 in locomotive expenses, and the increase of Rs. 1,93,497 in carriage and wagon expenses was mainly for heavier repairs.

	1934-35	1933-34
Passengers	29,285,446	27,878,593
General merchandise, tons	4,202,858	3,911,116
Mean mileage	2,113	2,113
Train-miles	8,852,109	8,277,185
Operating ratio, per cent.	47·87	45·94
	Rs.	Rs.
Coaching receipts	1,43,97,537	1,30,04,132
Goods traffic receipts	1,98,30,357	1,96,60,864
Total earnings	3,46,97,754	3,30,70,567
Working expenses	1,66,10,394	1,51,92,378
Net earnings	1,80,87,360	1,78,78,189

The company's share of net earnings was Rs. 1,05,85,331 realising £793,900, as compared with Rs. 1,04,36,524 and £782,739 respectively for 1933-34. Stockholders receive the same return (16 per cent.) as for the four previous years.

* * * *

B.A. Provincial Railway Company

This is a French-owned undertaking of 1,267 km. on the metre gauge and was formed in 1905. It has a central station in the City of Buenos Aires in the Avenida de Velez, and in addition to the Buenos Aires-Rosario main line it owns westerly and south-westerly extensions to General Villegas and to V de la Plata. For the year ended June 30, 1935, there was an increase in receipts of $426,643 and of $815,276 in expenses in Argentine currency, but in French money the receipts were down fr. 6,788,845 and expenses were down fr. 4,847,115. Most of the advance in expenses in Argentine currency was caused by the restoration, as from November 1, 1934, in consequence of the Presidential award, of the cuts in salaries and wages which had been in force since January, 1933.

	1934–35	1933–34
Passengers	2,179,557	2,082,931
Goods, tons	1,510,233	1,490,310
Operating ratio, per cent.	91·65	88·51
	Francs	Francs
Passengers and G.V.	5,132,657	5,806,683
P.V. receipts	44,288,822	50,769,475
Total receipts	51,987,020	58,775,505
Expenses	47,645,605	52,492,720
Net receipts	4,341,415	6,282,785

Total net income for the year under review amounted to fr. 5,281,703, against fr. 5,728,867 for the previous year. This fully covers bond interest, leaving fr. 792,255 to be carried forward. *Petite vitesse* receipts accounted for 85·19 per cent., and passengers and *messageries* for 9·87 per cent. of the total receipts.

* * * *

Accidents to Railway Servants

We regret that we must open this survey by reminding our readers that one of the assistant inspecting officers of the Ministry of Transport, Mr. Scott Main, died on July 14 last, and that owing to his illness the 34 inquiries into the more serious accidents to railway servants during the three months ended June 30 were held by Mr. Moore alone. Of these, 15 were fatal cases. The various inquiries were distributed among the companies as follows; the fatal cases are added in brackets: G.W.R. 1 (nil); G.W. and L.M.S. Joint 2 (1); L.N.E.R. 15 (5); L.M.S.R. 8 (5); L.P.T.B. 1 (1); Southern Railway 7 (3). The grades concerned in the fatal accidents were: permanent way men 5; painters 2; and one each from the ranks of carriage cleaner, stationmaster, shunter, driver of mechanical horse, goods inspector, and signal lineman. The other two were respectively an assistant at some private gas works, and a riveter with a private firm. The cause assigned in five cases was want of care, in three as due to misadventure, two to no look-out man, one to lack of proper understanding between the man killed and his mate, and one to an impetuous movement on the part of the deceased.

* * * *

Save to Travel

The railways do well to encourage prospective holiday-makers' savings, for the volume of their summer holiday traffic receipts must depend very largely upon the extent of this. Last year the G.W.R. initiated a holiday saving scheme very similar to that used in connection with the purchase of National Savings Certificates. This met with considerable success, and is being continued. A card is issued with spaces for 20 ordinary sixpenny postage stamps. On presentation at any G.W.R. booking office the card is acceptable as payment for a railway ticket in lieu of cash to the total face value of the stamps affixed. Now the L.N.E.R. and L.M.S. have begun a comparable but more elaborate scheme which has as an added inducement an allowance on every complete ten shillings saved of interest equivalent to 5 per cent. a year for one year. Cards similar to those used by the G.W.R. are issued, but the stamps used are specially designed for the purpose and are of one shilling face value. Each card has spaces for ten of these stamps, and on completion may be exchanged at any booking office for a ten shilling voucher. The interest starts to accrue only when the voucher has been obtained. A description of the new scheme, together with illustrations of the collecting cards and vouchers, appears on page 166.

* * * *

Mile-a-Minute Runs in Switzerland

On page 142 of this issue details are given of some striking developments which are to take place with the introduction of the summer train services on the Swiss Federal Railways in May next. The failure of the Swiss Federal to secure the control over road competition which was sought in the recent plebiscite, has made it necessary to devise bold measures of counter-attraction, and higher speed, needless to say, is the first element of the programme. Two new express trains are to be introduced daily, linking Zurich and Berne with Lausanne and Geneva, through the most populous part of the country, in an overall time of 3 hr. 25 min. for the distance of 179¼ miles, whereas the best existing time is a little under 5 hr. The speed limit is to be raised, except where restrictions are enforced for curves, to 110 km. (68½ m.) p.h., and the 37¼ miles between Lausanne and Geneva will be covered on one of the runs in 36 min. (62·1 m.p.h. start-to-stop), and on the others in 37 or 38 min., this being the section of the route best adapted to fast running. Light trains are to be used, and some of the 2-C-1 electric locomotives are being specially adapted, as described in our Overseas columns this week.

British Travel in American Eyes

It is of interest to read in the columns of our American contemporary *Railway Age* a summary of the principal characteristics of British railway passenger services which, in the opinion of a competent American observer, account for their commercial success. Among them are scientific pricing, based on the prices of competing services and sufficiently elastic, in a downward direction, to bring railway travel within the reach of those with lower incomes, while not making the patrons themselves feel in any way inferior when using these cheap facilities. Comfort, by reason of a cool climate and clean fuel, and without the cost or necessity of air conditioning, is an important asset; frequent service, even in rural areas, is another. The writer of the article is greatly impressed with the intensive advertising of British railways; and in this connection he mentions the advertisements in newspapers, business publications, magazines, posters—" beautiful lithographs," as they are described—on the sides of many thousands of collection and delivery vehicles operating in the streets, and indeed, in " every publicity medium . . . which bring railway travel, its comfort and economy, constantly before the attention of the public, surpassing the advertising of any competing form of transportation." But the feature of this advertising and of British railway sales effort in general, is that it is directed entirely towards getting passengers on to the trains, rather than on diverting traffic from one line to another. Competition with other forms of transport is the only competition allowed to influence railway propaganda.

* * * *

Advertising Freight Traffic Facilities

Naturally the American appreciation of the intensive advertising of British railways referred to in our previous note is concerned mainly with passenger facilities. Such publicity concerns the man in the street and therefore immediately strikes the tourist, but the British railways are deserving of no less credit for their recently-inaugurated joint freight advertising campaign. This is intended to augment previous efforts of the railway staffs to increase freight business, and not to replace any proved method. The facilities which are being featured in this campaign are: road-rail containers; Green Arrow registered transit; warehousing; C.O.D. by rail; country lorry services; exceptional loads; livestock insurance; and household and farm renewals. Each of the railway services in these connections has been made the subject of a special newspaper display, mostly designed for the daily press. In such cases as farm removals, however, designs have been prepared for selected farmers' journals, and with exceptional loads for representative journals of heavy industries. The L.N.E.R. has collected these specimen advertisements into a handy blue-covered 16-page brochure (10 in. × 8 in.), which has been issued to L.N.E.R. goods agents. Furthermore, suggestions for improvements are invited, so that the utmost co-operation of the staff may be secured to make the joint scheme a success.

* * * *

Safety Pits at Tube Stations

It has long been recognised that tube stations form favourite sites for suicides—perhaps the attraction for some persons of a fast moving train emerging from the confined space of a tube tunnel adds unpremeditated attempts to the number of deliberate acts. At any rate, tragedies of this kind at tube stations have been so frequent in recent years that the London Passenger Transport Board has been compelled to adopt some means of preventing them, or reducing the length of the delay they cause. Reference to this subject was made recently by Mr. George Hally, Operating Manager (Railways) L.P.T.B., in a paper he presented to the York Railway Lecture & Debating Society. He said that on the Morden Line, opened in 1926, a pit 1 ft. 4 in. deep was provided between the running rails throughout the length of each station. On the latest extension of the Piccadilly Line a pit 2 ft. deep was constructed, and the platforms were carried on arches to allow the staff to get underneath a train. Mr. Halley added that the comparative absence of suicides on these sections showed the value of the arrangement, and within the last year all the London tube stations had been provided with 2-ft. pits. We understand that the results have been very satisfactory, occurrences of this kind having become fewer and the delays occasioned by them greatly reduced.

* * * *

Uniformity in Air-conditioning Plant

Air-conditioning has gone a long way past the purely experimental stage on American railways, so much so that now the Equipment Research Division of the Association of American Railroads is to determine which among the many air-conditioning systems in use gives the greatest all round satisfaction, and whether any one system might be developed to show advantages great enough to warrant its adoption as the standard system. Readers of this journal will recollect that air-conditioning systems in America are broadly of three kinds. In the first ice is carried on the train, in the second a steam ejector relieves water of the pressure of the atmosphere and causes it to boil at a sub-atmospheric temperature so that its demand for latent heat constitutes a cooling effect, and in the third a vapour-compression refrigeration machine, axle or motor driven, is carried on each car. Besides controlling the temperature and movement of the air inside their railway carriages, the Americans control the humidity, for comfort is not a function of temperature alone, but of temperature and humidity. In this country it is necessary to distinguish between complete and partial air-conditioning for here most so-called air-conditioning gives warmth to the air in winter, and motion, but facilities for cooling the air in summer, and for controlling its humidity, are generally lacking.

* * * *

A New Mechanised Hump Yard

The working of inward goods traffic at Hull has hitherto been carried on under difficulties inseparable from restricted siding and marshalling accommodation. The problem has been rendered more difficult by reason of the large number of docks and other delivery points to which traffic is consigned. Moreover, Hull is a centre from which a number of important lines radiate, so that the problem is not merely one of handling traffic for terminal points in the immediate vicinity, but is concerned also with the sorting and despatch of traffic to important seaside and residential places, such as Bridlington, Withernsea, and Hornsea. The old inward goods yard at Hull had gradually become inadequate for the traffic, and in view of the increasing demand for freight to be despatched and delivered within a period of 12 hours, it was decided to lay out a new yard on the most up-to-date lines. In another part of this issue there will be found a detailed description of what has been accomplished, and the illustrations will tend to confirm our readers in our own opinion that the new yard is second to none. The successful operation of the hydraulic rail brakes at Whitemoor amply justifies their installation at Hull, and the latest refinements in signalling, point operation, and lighting, as well as in staff accommodation have been incorporated.

Queensland Government Railways

FINANCIAL results of the operation of the Queensland Government Railways for the twelve months ended June 30, 1935, were very gratifying, and the report thereon received from Mr. J. W. Davidson, Commissioner for Railways, is, as usual, full of interest. Gross earnings exceeded those for the previous year by £949,298, or 15·51 per cent. Expenditure, though £596,223, or 13·54 per cent., higher, was judiciously controlled. The additional cost of operation was occasioned by Industrial Court awards to the staff of £110,693, by writing off £53,853 on account of condemned rolling stock, by the greatly increased volume of traffic, and by the condition of the locomotives due to the abnormal mileage and the effect of bad water because of the drought. Yet the operating ratio was the lowest attained since 1914-15. Net earnings, which were higher by £353,075, or 20·58 per cent., than those for the previous year, constituted a new record and represented a return of £5 12s. 9d. per cent. on capital (opened lines), also a record. The best return before the capital was reduced by £28,000,000 under the provisions of the Railway (Capital Indebtedness Reduction) Act, 1931, was that of 4·508 per cent. in 1910-11. For the year under review the surplus over interest charges was £494,521, an increase over the preceding year of £334,403. Operating figures are compared in the accompanying table:—

	1934-35	1933-34
Miles open	6,497	6,497
Passenger journeys	24,249,641	22,806,056
Goods and minerals, tons	4,418,041	3,834,787
Train-miles	12,869,974	11,043,957
Operating ratio, per cent.	70·73	71·96
	£	£
Passenger revenue	1,448,924	1,375,542
Goods and minerals, receipts	4,207,810	3,568,297
Total earnings	7,068,196	6,118,898
Working expenses	4,999,593	4,403,370
Net earnings	2,068,603	1,715,528

Country passengers increased by 307,033 and brought in £55,636 more revenue, and the improvement in suburban travel represented 1,136,552 in numbers and £17,746. Nearly all the principal classes of commodities contributed to the increase in goods traffic of 583,254 tons and £639,513. General merchandise yielded an additional £185,791. The average haul per ton of goods and livestock was 144·46 miles, compared with 134·56 miles in the previous year. Train-mileage constituted a record for Queensland, representing an increase of 16·5 per cent. on the previous year. In the emergency created by the drought the railways performed a public service which would not have been possible to any other form of transport. During the year under review the railways conveyed about 3,500,000 sheep, of which 2,500,000 were transported during the six months January to June, many for distances of from 1,000 to 1,650 miles. This task, coupled with the increased passenger and goods business, and the necessity for the haulage over long distances to drought-stricken areas of thousands of tons of fodder for the feeding of starving stock, was performed under difficult conditions. Normally the January-June period is a slack one during which the opportunity is taken to overhaul locomotives and rolling stock, but this was not possible during the first six months of 1935 because of the exceptionally heavy traffic. Installation of three water-softening plants was undertaken during the year, of which two—at South Brisbane and Gootchie—are now in service. As a result of the programme of strengthening lightly-constructed lines, regrading of sections, and greater use of heavier types of locomotives the average goods train load is now 260 tons, compared with 209 tons a decade ago, and the increase in the average load was accompanied by increased efficiency in coal consumption. The work of duplicating the six miles of line between Stewart's Creek (the junction of the North Coast and Great Northern Railways) and Townsville is well in hand.

* * * *

James Watt, 1736-1819

DURING the past few days all the modern resources for disseminating information have been used to pay tribute to James Watt, the bicentenary of whose birth, at Greenock on January 19, 1736, fell on Sunday last. Watt is far too great a figure to ignore, if only because his work made possible the industrial revolution upon which modern life is founded, but in studying his life story one is faced with a paradox not easily understandable. Briefly it is this: his work in the development of the steam engine introduced the era of power-driven machinery upon which civilisation is now based, but he retarded its natural growth both by his opposition to the use of higher boiler pressures and—more especially—by his obvious disbelief in the practicability of steam traction. It is unnecessary to outline the details of Watt's career, for these have been set out adequately and well in a memorial volume by Mr. H. W. Dickinson which we notice in our Publications Received column on page 139. Nor need we do more than point out that the story spread by his cousin, Mrs. Campbell, about the young inventor studying steam issuing from a kettle has created in the popular mind an erroneous impression that the great inventor's work was irresponsible and accidentally inspired.

Watt's great work consisted not in " inventing the steam engine " but in so improving and developing that machine as to make it commercially possible, and therein lies his true claim to our homage as the father of the industrial revolution. Long before his time Denis Papin and Newcomen used the power of steam, the former with a single chamber as a combined boiler, cylinder, and condenser; and the latter with a separate boiler but still condensing steam in the cylinder with the consequent cooling and reheating for every stroke. In 1724—twelve years before Watt was born—a work called " Theatrum Machinorum " was published in Germany and included Lenfold's double-cylinder high-pressure steam engine, and it is sufficient indication of Watt's careful study of previous achievements in steam engineering that he learned German for the express purpose of reading this work. In 1765 Watt conceived the separate condenser engine and eventually, with the aid of Dr. John Roebuck of the Carron Ironworks, was successful in securing his famous patent of 1769. Following Dr. Roebuck's financial difficulties, Matthew Boulton of Birmingham bought his share in the patent, and when in 1775 the life of that patent was extended for 25 years, the famous partnership of Boulton and Watt was established.

Perhaps the least satisfactory feature of Watt's life—and the most interesting so far as transport is concerned—was his dog-in-the-manger attitude towards other experimenters and in particular towards steam locomotion. Boulton & Watt refused to grant licences to other engine builders and strenuously pursued infringement of the basic patent, so that it was difficult for any progress to be made. Moreover, when William Murdock, who had entered the service of the firm in 1777, took up the subject of steam carriages in his spare time, his employers did all they could to discourage him, and there seems little doubt that Watt's own patent for a steam carriage was taken out to keep Murdock quiet and to exclude other experimenters who were studying steam locomotion.

Railway Country Lorry Services

DURING the last few years the railway companies have in many areas considerably developed their collection and delivery arrangements for the purpose of providing regular and reliable cartage services between farms and villages in rural districts and bringing outlying hamlets within reach of railway stations. Introduced experimentally in Wales nearly twenty years ago, this system of motor lorry services, now termed railway country lorry services, has been so extended that it operates from upwards of 1,700 stations throughout the country and is creating a link between producer and consumer which is of growing national importance. By these services agriculturalists and others are enabled to give standing orders to convenient railway stations for all traffic to be delivered to their premises up to twenty miles from the railhead, while in the reverse direction, the lorry services run in connection with the departure of trains, and thus enable the most expeditious transits to be given agricultural and farm produce. To meet the requirements of traders, simplified scales of charges are quoted covering road or road and rail conveyance and farmers whose premises are situated a considerable distance from a railway station can purchase their requirements at prices which include delivery.

Where necessary, lorries are specially adapted to deal with particular traffics: thus hay ladders are fitted to lorries conveying hay and straw; stanchions and chains are used on lorries conveying milk churns; and special vehicles with low floors and extra large body space are used for livestock traffic. To facilitate the conveyance of milk traffic, roadside stages on which full and empty churns are exchanged, have been erected in a number of districts. The country lorry service is especially useful for the rapid delivery of agricultural machinery or spare parts—particularly in association with the registered transit arrangement—and also for the transport of corn and other seasonable produce. To assist agriculturalists generally, arrangements are also made for the provision of storage accommodation at stations so that manufacturers, farmers, millers, and others can hold stocks of general merchandise, grain, potatoes, cattle feeding stuffs, and so on, until delivery is required. There is a steady increase in the user of these facilities, and the gradual extension of the number of country lorry services is proving a material factor in the development of rural areas and local industries such as brickmaking and quarrying.

* * * *

Monorails

THE limitations of speed and stability imposed by the standard 4 ft. 8½ in. gauge have resulted in much ingenuity being expended to provide a more satisfactory alternative. A hundred years ago Brunel decided upon his famous 7 ft. 0¼ in. gauge and undoubtedly achieved a great measure of success, but the main reasons for its eventual abolition—namely, the difficulties of break of gauge and the impossibility of through running—are also those which have retarded other experiments. In hilly country, where sharp curves have to be negotiated, many narrow gauge railways have, of course, been built, and continue to fulfil requirements satisfactorily, but with consequent speed restrictions. Naturally the theoretical solution is to abolish the gauge and run on one rail only, thereby permitting of both maximum and curvature and greatest speed. To secure the remaining requirement of stability, experiments have been divided into two main classes, namely, by gyroscopic stabilisation and by use of guide rails.

Although the spinning-top has been for centuries a familiar toy in many lands, no attempt to use its stabilising properties for travel purposes appears to have been made until comparatively recent years. Even the invention of the three-framed gyroscope by Bohnenberger in 1832, and of the gyroscopic clock by Foucault in 1852, do not seem to have suggested the possibility. The first proposal to apply gyroscopic stabilisation to a monorail car appears to have been due to Louis Brennan, who on December 11, 1903, applied for a British patent for his system. By 1907 he had made such progress that he was able to exhibit a fairly large working model of his monorail car at a soirée of the Royal Society on May 8. In September, 1908, Richard Scherl applied for his first (German) patent in this field, and in May, 1909, Peter Schilovsky made his first application. On November 10, 1909, Brennan exhibited in London a full-sized car capable of carrying a load of 10 to 15 tons, and providing accommodation for 40 persons standing. On the same day Scherl exhibited at the Berlin Zoological Gardens a car with seats for six persons. Brennan's car was afterwards shown at the Japan-British Exhibition in London in 1910, but failed to achieve practical success. In 1921-2 the Russian Soviet Government decided to construct a monorail line, on the Schilovsky system, between Petrograd and Tsarskoe Selo, a distance of approximately 20 miles. About 7 miles of the monorail track was constructed, but difficulties of finance and lack of mechanical resources brought the work to a standstill in 1923. Up to the present time none of these experiments has resulted in the introduction of a gyroscopic stabilised monorail car into regular service.

In the sphere of guide rail stabilisation we can recall only one system which has been brought into public service, namely, the Lartigue. The general idea dates back to about 1837, but was introduced in practical form in 1883 by M. Charles Lartigue, a Frenchman. The arrangement was a single running rail carried 3 ft. above ground level on trestles. Carriages ran astride on this and were stabilised by guide rails on each side some 2 ft. 4 in. below the running rail. Various light horse-operated railways were built on this system in the 'eighties in Algeria and Tunis; a steam-worked line was established in 1894 between Tours and Pannissieres in the Departement de la Loire; and the well-known 9½-mile Listowel and Ballybunion Railway in County Kerry, Ireland, was opened on March 1, 1888. The last-named was built in nine months by the Lartigue Railway Construction Co. Ltd. and in 1895 was demonstrated by the Managing Director of that company, Mr. F. B. Behr, to the International Railway Congress. It survived until October, 1924, when it was closed as a result of road competition and subsequently dismantled. This railway was illustrated and described in THE RAILWAY GAZETTE of September 12, 1924. The Kearney system, which has not so far been applied practically, proposes to run on a monorail underneath the cars and to use a guide rail above the cars to secure stability chiefly at such times (for example, in stations and on curves) when the natural stability of the moving vehicle is insufficient.

Another class of monorail is the cable suspension type of line used extensively in the mountainous parts of such countries as Germany, Switzerland, Austria, and Italy, mainly to cater for tourist traffic to famous viewpoints and winter-sport centres. These railways scarcely come within the category of ordinary commercial railways, however, but there is one suspension line—with a rigid overhead rail—which serves a heavy urban traffic. This is the famous Barmen-Elberfeld Railway along the valley of the River Wupper in the west of

Germany. It was built to the system invented by Herr Eugen Langen, a Cologne manufacturer who died in 1895 before seeing its practical application. The carriages hang free from an overhead rail carried on a girder structure. This unique railway, formally opened in part on October 24, 1900, by the German Emperor, and completed during the next two years, was described in our *Electric Railway Traction Supplement* dated February 9, 1934, and its signalling in THE RAILWAY GAZETTE of October 18 last. Finally, in this brief survey of monorails mention must be made of the Railplane system of transport devised by Mr. George Bennie. An experimental section of full-sized track was built in 1929 over the L.N.E.R. line at Milngavie near Glasgow, and illustrated in THE RAILWAY GAZETTE of July 11, 1930. Further reference is made on page 139 in a notice of a recently-issued brochure describing the system.

* * * *

Summer Locomotive Work in France

RECORDS of the work done during July, August, and September, 1935, by the 31 Pacifics shedded at Tours on the P.O.-Midi system show a continuous performance of a remarkable character. Apart from the Sud Express, which normally loaded to 240 tonnes, the expresses worked by these machines on the St. Pierre des Corps to Bordeaux section averaged about 550 tonnes in weight behind the tender, and if trains 15 and 16 (averaging 380-400 tonnes) are neglected, the average weight over the whole three months was about 650 tonnes, with a maximum loading of 803 tonnes. The schedules of these trains called for the maintenance of 50-60 m.p.h. up 1 in 200 grades, and for certain lighter trains scaling 400-500 tonnes, 65-68 m.p.h. Yet, according to our French contemporary *Transports*, time was gained by the engines so consistently that on the workings of six of the heaviest trains the total gain to the credit of the locomotives during the course of August was 1,853 min., and in September, 1,798 min., constrasted with respective losses of 35 and 46 min. booked against the engines. Further, the Sud Express, with its successive schedules of 59-70 m.p.h. between St. Pierre and Bordeaux, had 628 min. to the credit of the locomotives in July, 635 min. in August, and 629 min. in September. In face of such figures as these, which were supplied officially by the P.O.-Midi to our contemporary, one may be pardoned for wondering at the reason for the loss on an average of 10 to 20 min. a train, day in and day out, apparently by exceeding the station allowances or by signal checks. Certainly, the oft-quoted excuse of trains handed over late at the Spanish frontier will not do, for as much time was lost and gained in the down direction as in the up. It may, of course, be a deliberate policy of showing too-brief station stops in the hope that the passengers and station staffs may be urged to observe them, and the knowledge that, if they do not, the engines can make up the loss. On the Tours-Nantes line, over which these 31 Pacifics work also, the train weights rose to 800 tonnes, and on occasions a train of this weight was worked along the level at 72-73 m.p.h. with a cut-off of 50 per cent. in both high and low pressure cylinders by one of the first 21 rebuilds (Nos. 231.701-721) which are supposed to develop about 200 d.b.h.p. less than the latest 10 (Nos. 231.722-731) when operating at maximum output. The average distance covered per machine taken over the whole 31 engines was 4,400 miles a month, with a maximum of 6,750 miles, but these figures are governed more or less by the practice of keeping one engine to one crew. With such a high standard of performance maintained day after day throughout the summer, with schedules and trailing loads calling for the maintenance of 2,000 d.b.h.p. or more for long stretches, it is difficult to pick out any one feature more meritorious than another, but an idea of the capacity of these Chapelon Pacifics was given in the article on French locomotive performance in THE RAILWAY GAZETTE for November 29. Particulars of the coal consumption during the summer are not available, but considering that, as recorded in the aforementioned issue of THE RAILWAY GAZETTE, the consumption on the Sud Express when loaded up to 616 tons trailing was aproximately 50 lb. per mile on the very fast bookings from St. Pierre to Bordeaux, the consumption of the 650-800 tonne trains on somewhat slower schedules cannot have been excessive.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Stevenson and Stephenson

Coll-Earn, Auchterarder,
Perthshire, January 16

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—In your issue of December 13 last (page 1004) you quote from your ancestor THE RAILWAY MAGAZINE of "One Hundred Years Ago" how Sir John Sinclair in 1822 consulted "a Mr. Robert Stephenson, C.E., of Edinburgh," about his idea of a railway between the capitals of these two Kingdoms. I think this must be an editorial error for "Robert Stevenson of Edinburgh," the father of modern lighthouses and, with Stephenson of Newcastle-on-Tyne, the joint parent of modern railways.* For Stephenson in a voluminous correspondence sought much advice, and got encouragement and many ideas, from Edinburgh; like as the Bishops of Rome in the first centuries wrote to the Patriarchs of the ancient Egyptian Church at Alexandria, as to an elder brother, for advice on doctrinal problems.

The Stevensons of Edinburgh were (and are) the famous lighthouses engineers (consulting). He evolved the Stevenson angle (or shall we say "curve") for the base. Up till then every lighthouse subjected to heavy seas had, in time, been moved or racked by the wave-weight. Stevenson's foot-curve makes the wave pound directly downwards. Applied to the Bell Rock light (guarding the Firth of Forth), under His Majesty's Commissioners of Northern Lighthouses, (Scotland and the Isle of Man—part of Scotland), it is now universal.

In the Egyptian inscriptions one hieroglyph puzzled the experts till not long ago. It was nothing more or less than a stumpy Stevenson lighthouse—I remember gazing at it on certain tombs and coffins. Working back from the fact that it seemed to be used only for powerful Pharaohs, the experts found that it meant stability, hence was given to a man firm of purpose. Stevenson invented many things and also got malleable iron used for rails in place of cast. The Stevensons also worked out modern dioptrics and were able, as a feat *in excelsis* in their art, to place a 6,000,000 candle power beam flashing from May Island. I have read my watch by it at 23 miles and a captain told me he has picked it up at 70 miles. This Stevenson of Edinburgh finding Trevithick, the father of the locomotive, stranded in South America, gave him £50 to get home with.

Sir John Sinclair was also a wonderful man who was known to the great ones all over Europe and wrote vast volumes in various languages on many learned matters. We might call him, "The Admirable Crichton of Thurso in Ultima Thule."

I remain,
Yours steadfastly,
NORMAN DORAN MACDONALD

* Doubtless the engineer consulted was really Robert Stevenson, but was shown as Stephenson in THE RAILWAY MAGAZINE of December 1835, from which we quoted.—Ed. *R.G.*

PUBLICATIONS RECEIVED

James Watt, Craftsman and Engineer. By H. W. Dickinson. London: Cambridge University Press, Fetter Lane, E.C.4. 9¾ in. × 6¼ in. × 1 in. 207 pp. Illustrated. Price 10s. 6d. net.—For many years the name of James Watt has been familiar to most school children in alleged circumstances which have not only failed to do justice to the work of the great inventor by creating the impression that it was haphazard, but have also ignored his outstanding quality of craftsmanship. The life of a great man nearly always repays study from more than one point of view, and the greater the man, the more numerous are the aspects which can profitably gain attention. With this in mind Mr. Dickinson has, happily, chosen Watt's craftsmanship as the main theme of the present volume, which is, of course, issued in connection with the bicentenary celebrations to which we make editorial reference on page 136. A study of Watt from this unconventional angle is especially suitable at the present time in view of the few years which have elapsed since the centenary memorial volume entitled "James Watt and the Steam Engine" was prepared by the present author in collaboration with Mr. Rhys Jenkins. As Watt lived to the age of 83, the difference between the centenary of his death and the bicentenary of his birth is but 17 years; furthermore, it will be remembered that the centenary volume* was not published until 1927.

Mr. Dickinson's further examination of the Watt documents for the preparation of the present book has resulted in no new conclusions. On the question of steam traction he says that there does not seem to be any doubt that Watt's patent claim with regard to steam carriages was put in because Murdock had taken up the subject in his spare time and was engrossed in it. Watt and Boulton not only wanted to keep Murdock quiet, but wished to exclude others, for numbers of persons were experimenting with steam carriages. It is abundantly clear that the partners had no intention of going into the matter; this is proved by a letter of quite extraordinary length from Watt to Boulton (dated August 31, 1784) winding up with this dictum: "You will see that . . . the machine . . . will cost much time to bring it to any tolerable degree of perfection and for me to interrupt the career of our business to bestow my attention on it would be imprudent." Murdock was valuable and the partners knew he was too loyal to the firm to leave it, so they talked him over for the time being. He kept hankering after steam carriages, however, as is shown by a letter of two years later (September 12, 1786) from Watt to Boulton:—

> I am extreamly sorry that W. M(urdock) still busys himself with the St[m]. Carriage. . . . I have still the same opinions concerning it that I had, but to prevent as much as possible more fruitless argument about it, I have one of some size under hand & am resolved to try if God will work a miracle in favour of these carriages.

Mr. Dickinson adds the comment, "as far as we can find out, the alliance of Watt with the Deity adumbrated in this letter did not 'work a miracle in favour of these carriages,' and their appearance on the roads was delayed for nearly half a century." The author, while taking this necessary attitude, is not unkind to his subject, and, in fact, places his reputation on deservedly sure ground when he says: "Watt did not invent the steam engine, though all his life long he was an inventor and an engineer, and his work on the development of steam power was an important contribution to its subsequent perfection. For this he is justly famous. But he was remarkable as a craftsman, too. Practical knowledge of tools and materials stood him in good stead in his working life, and when he retired, he retired to his workshop to find in craftsmanship the solace of his leisure and his old age."

* Reviewed on page 357 of our issue of March 16, 1928.

100 Years German Railways—83 Years Schwartzkopff. Berlin: Berliner Maschinenbau A.G. (formerly L. Schwartzkopff). London: Fredk. A. Perry, Ormond House, 63, Queen Victoria Street, E.C.4. 12 in. × 8½ in. 68 pp. Illustrated. No price mentioned.—This interesting and admirably produced volume is dedicated by the Berliner Maschinenbau A.G. to the German State Railway Company on the occasion of the centenary of the German railways. As is stated in the preface, the evolution of this well-known firm of locomotive builders, founded 83 years ago by Louis Schwartzkopff, formerly Manager of one of the oldest railways, the Magdeburg-Wittenberg Railway, has run parallel, in the main, with the development of the German railway affairs. The 68 pages of the book bear eloquent testimony to the active part which the Berliner Maschinenbau has taken in supplying the world with locomotives of all types and sizes. There are numerous half-tone illustrations, with, in addition, some outline and sectional drawings of steam, electric, and diesel locomotives.

A section is devoted to industrial types of engines, and two Schwartzkopff designs for super-express locomotives, one planned to develop 3,400 h.p. and the other equipped with a special form of boiler known as the Velox, developed and tested by Brown Boveri, are illustrated and briefly described. The Schwartzkopff - Löffler ultra - high - pressure locomotive of 1930 is made the subject of further illustrations and comments. The principal dimensions of the locomotives illustrated are contained in a separate folder of four pages, accommodated in a pocket on the inside back cover of the main publication. The copy of the volume before us is in English, and the whole publication is worthy of the firm and the position it holds in the locomotive world.

The Railplane System of Transport.—The firm of Inter-Counties Limited, which includes Mr. G. Bennie on its board of directors, has recently issued a 28-page pamphlet setting out the chief advantages claimed for the Railplane system of transport. Broadly, the system consists of a streamlined car suspended from bogies running on a single overhead rail. The car is driven by airscrews at each end operated either by diesel engines or electric motors. The track is a lattice box-girder construction on steel trestles spaced about 80 ft. apart. It is suggested that the system is particularly applicable for segregating fast passenger traffic from other railway services, as a Railplane track could be built mainly over existing main lines. Its ability to negotiate 1 in 25 gradients is stressed as making possible a line following ground contour and thus avoiding tunnelling and heavy earthworks. The pamphlet gives details of a suggested London-Paris service using Railplanes on the London-Folkestone and Boulogne-Paris section and seaplanes for the Channel crossing. The high speeds possible with the Railplane give an estimated journey time of 2½ hours. Another feature of the Railplane claims is its ability to assist in slum clearance. Mr. Charles Boot, a Director of Inter-Counties Limited, has advocated in a brochure called "A Scheme for the Abolition of Large Slum Areas," the building of two new satellite towns, each accommodating 25,000 families. The present pamphlet contains a map showing suggested sites outside London, near Waltham Abbey and Dagenham, respectively, joined by a Railplane line through Walthamstow and Stratford, and following the course of the River Lea and the Northern Outfall sewer. Its relatively cheap cost of construction is advocated as making possible cheap suburban fares so that the satellite towns would be available to working classes.

L.M.S. Tide Tables.—The tide tables for 1936 in connection with the L.M.S.R. ports at Garston (Lancs.), Barrow-in-Furness, Heysham, Fleetwood, Goole, Grangemouth, Ayr, and Troon, have just been issued. These booklets, containing information about tides, depth of water, &c., may be obtained free.

Spot Welding Tips.—Thomas Bolton & Sons Ltd., Mersey Copper Works, Widnes, announces in a leaflet the production of a new copper alloy, Durode, developed specifically for use as electrode tips of spot-welding machines. This alloy is claimed to increase durability to an extent far out of proportion to the small loss in conductivity resulting from the combination of other wear-resisting metals with the copper. Finished welding tips can be supplied in any size or shape, or the material can be supplied in the form of rods.

THE SCRAP HEAP

Railway Directors admonished by the Speaker

"The House has had many great Speakers, but I doubt whether in its long history it has ever had a greater than Arthur Wellesley Peel. Others have served it faithfully and many of them with great distinction, but Speaker Peel *dominated* it. In the opinion not only of one like myself who was still a young member when he retired, but of older men who had been present at his first election, he stood in a class by himself, over-topping his predecessors, never equalled even by the most successful and respected of his successors. He had a natural dignity and a formal but genuine courtesy which well became the occupant of the Chair, and, besides a dramatic gift which in great moments raised him so far above his fellow-members that the whole House trembled at his rebuke. At such times his stature seemed to grow before our eyes, but his deep resonant voice dominated the tumult and he appeared as the living embodiment of centuries of parliamentary tradition.

"One such moment occurred in the closing days of the Parliament of 1892. A Select Committee of the Houses had been inquiring into the hours of work of railway servants, and among the witnesses who had given evidence before it was the stationmaster of some small station on the Cambrian Railways. He had subsequently been called before three of the directors and the General Manager of the company and dismissed, nominally for some irregularities in his accounts but really, as was obvious from the questions put to him by the directors, on account of the evidence which he had given before the Select Committee. The committee, of which Sir Michael Hicks Beach (afterwards Viscount St. Aldwyn) was Chairman, took evidence as to what had passed and made a special report to the House on the case as a breach of Privilege. Of the three directors involved, one, Sir John Maclure, was an old and much-liked member of the House. A day was fixed for the discussion and an order was made by the House that the honourable member for Stratford should attend in his place and that his co-directors and the General Manager should appear at the Bar. They were asked if they had anything to say and Sir John Maclure offered an apology with which the others associated themselves. They were then ordered to withdraw while their case was considered, and Hicks Beach moved: 'That this House while recognising that they had expressed their unqualified regret for having unintentionally infringed any of its Rules and Privileges is of opinion that they have committed a breach of Privilege . . . and that they be called in and admonished by the Speaker.'

"This seemed a rather lame conclusion and there was a good deal of sympathy with the proposal made by T. P. O'Connor to add that the House would not consider that they had purged their contempt till they had reinstated the discharged man. Efforts were made privately to get them to do this, or at least to compensate him, but they remained obdurate. Hicks Beach's resolution was supported by Mr. Gladstone, but his advice was rejected by the great majority of his followers whose zeal for the injured man was perhaps stimulated by the value of the railway vote at the general election which was known to be imminent. A long, wrangling discussion followed and it was not till midnight that a division was taken and Hicks Beach's resolution carried.

"Then the directors were once more called in. Sir John Maclure evidently felt his position acutely, but the other three appeared at the Bar defiantly and almost jauntily. They had successfully resisted the desire of many members, not confined to one side of the House, that they should compensate the man, and now they were to have what schoolboys call a 'pi-jaw' from the Speaker—that was all the House of Commons could do to them.

"Mr. Speaker Peel spoke for less than ten minutes. 'I would have you to know—each and all of you gentlemen— that though the Privileges of this House are not to be put into operation on any light or trivial occasion . . . yet a Privilege of this House is no unreal, shadowy or unsubstantial thing; it is what the House clings to and what it is determined to maintain.' And then after expatiating on the enormity of their particular offence, he declared, 'The House in its judgment and, I should add, in its mercy, has decided that I should admonish you,' and he proceeded to administer the admonition.

"The bald words of what he said, recorded in *Hansard*, convey no idea of the devastating effect of that short allocution. The men who had come to the Bar so defiantly a few minutes earlier wilted under his admonition; beads of perspiration stood out on their foreheads and, when he dismissed them, they crept away like whipped hounds, while the rest of us shook ourselves like dogs coming out of the water and thanked heaven we had not been in the position of poor Maclure."
—*From "Down the Years" by Sir Austen Chamberlain.* (*Cassell & Co.*).

674 THE RAILWAY TIMES.

WEST LONDON RAILWAY.—The London and Birmingham Railway Company have made an abatement in their Fares in favour of Passengers travelling on the West London Railway, to the extent of the Fares charged by the West London Railway Company.

TIME TABLE.—10th JUNE, 1844.

DOWN TRAINS (Sundays excepted.)

In conjunction with Trains on the London and Birmingham and Great Western Railways.

	Departure from Kensington.	Departure from Shepherd's Bush.	Arrival at Great Western Junction.	Arrival at London and Birmingham Junction.	To meet Trains on Great Western Railway leaving Paddington.	To meet Trains on London and Birmingham Railway leaving Euston square.	
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	
1	6 55	7 0	....	7 10	....	7 0	3rd Class to Birmingham
2	8 50	8 55	9 0	....	9 0	.....	Mixed to Maidenhead.
3	10 20	10 25	....	10 35	....	10 30	Mixed to Wolverton.
4	10 45	10 50	10 55	11 0	11 0	.....	Mixed to Maidenhead.
5	2 55	3 0	....	3 10	....	3 0	Mixed to Wolverton.
6	5 55	6 0	....	6 10	....	6 0	Mixed to Wolverton.
7	6 20	6 25	6 30	....	6 30	....	Mixed to Slough.

UP TRAINS (Sundays excepted).

	Arrival at Kensington.	Arrival at Shepherd's Bush.	Departure from Great Western Junction.	Departure from London and Birmingham Junction.	Meeting Trains on Great Western Railway.	Meeting Trains on London and Birmingham Railway.	
	H. M.	H. M.	H. M.	H. M.	H. M.	H. M.	
	9 50	9 45	9 40	....	From Slough 0 6	.....	Mixed,
	10 45	10 40	....	10 35	....	From Reade. 7 30	Mixed.
	1 0	12 55	....	12 45	....	From Aylesbury 11 0	Mixed.
	6 50	6 45	6 40	....	From Slough 6 0	.....	Mixed.

FARES—First-Class Passengers, 1s.; Second-Class, 6d.

Passengers by Trains Nos. 1, 3, 5, or 6, will be booked at the London and Birmingham Junction Station to Watford, from whence they can be booked forward to any more distant Station on the London and Birmingham Railway.

Passengers by Trains Nos. 2, 4, or 7, will be booked at the Great Western Junction Station to Slough, from whence they can be booked forward to any more distant Station on the Great Western Railway.

Time Tables of the London and Birmingham and Great Western Railways can be obtained at either of the Stations of the West London Railway.

Omnibuses will be in attendance at the Kensington and Shepherd's Bush Stations to meet every Train; Goods will be conveyed on the West London Railway, at rates which will be stated in separate Bills, to be had at the Stations.

10th June, 1844.

Timetable, from "The Railway Times" of June 15, 1844, of the short-lived early train service on the West London Railway. The single-track line was opened on Monday, May 27, 1844, from Kensington station to its junction with the G.W.R. The above service came into force on June 10, but passenger service was withdrawn on November 30 of the same year. The West London Railway passed into the hands of the G.W.R. and L.N.W.R. as from March 11, 1845, but was used only for mineral traffic until it was doubled and reopened for passenger traffic on April 1, 1863

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

INDIA

Railway-Shipping Competition

Sir Zafrulla Khan, Member for Railways and Commerce, presided at the informal conference convened by the Government of India at Delhi, on December 20, to discuss the question of competition between the railways and the shipping companies for inter-port traffic. Such competition, it was contended, had seriously affected the finances of the various port authorities. The conference was attended by railway officials, the Chairmen of the Calcutta, Bombay, Karachi, and Madras Port Authorities and representatives nominated by the Associated Chambers of Commerce and by the Federation of Indian Chambers of Commerce and Industry.

Complaint of Ports and Shipping

On behalf of the ports and the shipping companies, it was alleged that the railways had in some cases deliberately manipulated railway freight rates in order to take away a certain amount of traffic from the shipping companies. This had not only resulted in losses to the shipping companies and the ports, but had to some extent diverted trade from its established channels. The reduction of railway freights was not in itself objectionable so long as the resulting advantage to the railways corresponded at least to the loss it inflicted upon coastal shipping and ports. It was suggested, however, that the railways had gained or were likely to gain as a result of such manipulation far less than the damage caused to shipping and port interests.

The spokesmen of the chambers of commerce, apart from shipping interests, viewed with apprehension any arrangement between the railways and the shipping companies, which would have the effect of raising transport charges. Businessmen had at various times accused the railways of indifference in the matter of procuration of traffic, it was not for them, therefore, to object to the railway endeavouring to keep traffic to the rail route. The claims of other interests besides railways and shipping had also to be considered.

The Case for the Railways

On behalf of the railways it was explained that the freight rates charged in competition with shipping were in no case lower than the cost of transport to the railway. The profit might in some cases be low, but there was always a margin. The railways were prepared to consider any equitable arrangement with the shipping companies, but any such arrangement was bound to result in an enhancement of the existing rates. There was also the difficulty of ensuring that any agreement arrived at between the railways and the shipping companies for the distribution of traffic was not likely to break down by the incursions of outside tonnage.

It was finally agreed that the respective port authorities should, in consultation with the shipping companies and local chambers of commerce, conduct negotiations with the railway administration with which they were immediately concerned with a view to considering, in individual cases, on what lines conflicting interests could be reconciled.

Chittagong Port Advantages

At a recent meeting of the Local Advisory Committee of the Assam-Bengal Railway held at Chittagong, with Mr. G. E. Cuffe, General Manager, in the chair, it was decided that adequate publicity should be given in Assam and Eastern Bengal to the financial advantages of trading with Chittagong. The natural advantages of Chittagong as a port were not utilised to the fullest extent possible. There was a considerable trade in rice, cement and artificial manures through Chittagong, but there were many other articles and commodities for which Chittagong offered a cheaper port of import. Road transport had considerably developed in recent years, but the number of cars imported through Chittagong was comparatively small. The opening of the Sylhet-Shillong road had greatly facilitated imports via Chittagong. The principal obstacle to the greater development of the Chittagong route was the absence of business houses and agencies in Chittagong in direct touch with the up-country markets.

A.-B. R. Developments

A statement of the improvement in train service, revealing an increase in the speed of trains on almost all sections, was placed before the meeting. The improved facilities are reflected in the passenger earnings, which are Rs. 2½ lakhs more than the figures for the corresponding period of the previous year.

The committee agreed with the Agent's view that the construction of the Rajapur-Ramchandrapur and of the Noyapara-Chatalpara branches was not at present financially justifiable. A proposal for the extension of the Syhet branch to Chettack was also discussed.

Working of Railway Court

The innovation introduced last year of holding a court within the railway premises at Howrah for the trial of offences under the Railway Act has, according to the report of a year's working, been very satisfactory. The total number of cases tried by the Railway Magistrate during the 12 months from September, 1934, to August, 1935, was 4,174 and the total number of persons tried during the period for offences under the Railway Act was 8,099: a sum of Rs. 11,000 was realised in fines. There seem to have been fewer cases on the Bengal-Nagpur Railway than on the East Indian Railway, although the Railway Magistrate exercises his territorial jurisdiction over a greater area on the former railway system than on the latter, which, however, has a considerably greater traffic density.

N.W.R. Bridgework Developments

The Nandna Bridge on the Golra-Basal section is being strengthened up to the M.L. (Main Line) Indian standard of loading. The spans, of which there are two, each measure 94 ft. 6 in. between centres of bearings and are of the decked type. A third girder is being added in the centre of each span, and troughing laid transversely on the three girders provides a deck for the ballasted track.

The Nari Bridge on the main line to Quetta is to be rebuilt shortly. The 105-ft. pony truss spans, five in all, will be replaced by through-type plate girder spans, the track being carried on an open floor of stringers. It is at present a combined road and rail bridge, but a separate road bridge is to be constructed by the Public Works Department.

SWITZERLAND

Important Accelerations

With the introduction of the 1936 summer timetable on May 15, the Swiss Federal Railways will enter the field of accelerations by placing in service two limited trains between Geneva and Zurich, which will complete the journey of 287 km. in 205 min. The fastest run at present made by the Berne route takes 293 min., and most express trains take considerably over 5 hours. Fribourg, Olten, and Aarau will be passed for the first time without stopping, the only intermediate stops being of 2 min. each at Lausanne and Berne.

The trains will consist of three coaches of the latest type (probably weighing 38 tonnes each), with a total seating capacity of 204 or 219, according to the amount of second class space which may prove necessary, and a 6-wheeled luggage-van, which will be immediately in rear of the locomotive. They will be hauled by 4-6-2 (2-C-1) electric locomotives, a number of which are undergoing various improvements in preparation for this service. For these through light trains, the maximum speed permissible has been increased to 110 km. (68·2 m.)p.h. where the gradient is 1 in 100 or easier, and to 105 km. (65·1 m.)p.h. on gradients between 1 in 60 and 1 in 100. No provision is being made to lengthen the distance between the home and distant signals, but the trains will be enabled

to pull up within the same length at higher speeds by augmenting the pressure of the Westinghouse brake from 5 to 6 atm.; trials have shown that an increase of 20 per cent. in the pressure on the brake shoes will result. Drivers are reminded of curves which must be approached at reduced speed by square warning-boards mounted on one of the electric standards about 300 metres before each curve, showing in large black figures on a white ground the maximum speed permissible. The beginning of the curve is marked by another white board with three diagonal stripes. Such boards were fitted early in 1935 on the lines on which the electric high-speed railcars have been running since May 15 of that year.

61 m.p.h. Start to Stop

The average speed for the whole run is 84 km. (52 m.)p.h., and for the Geneva-Lausanne portion, on which there are fewer speed restrictions, it will be as high as 97 km. (61 m.)p.h. One train is booked at 100 km. (62 m.)p.h. The following timings have been arranged:—

Km.				
	Geneva ...	dep.	6.33	19.40
60	Lausanne ...	arr.	7.10	20.18
	,, ...	dep.	7.12	20.20
157	Berne ...	arr.	8.23	21.31
	,, ...	dep.	8.25	21.33
287	Zurich ...	arr.	9.58	23.06
	Zurich ...	dep.	7.07	19.30
130	Berne ...	arr.	8.40	21.02
	,, ...	dep.	8.42	21.04
227	Lausanne ...	arr.	9.53	22.16
	,, ...	dep.	9.55	22.18
287	Geneva ...	arr.	10.31	22.55

Material accelerations will also be made of a number of local trains on various lines. These will be of lighter formation—limited to 150 tonnes—and will carry no milk or parcels, so that station stopping times will be considerably reduced, in the case of small stations to 30 sec. and larger ones to 1 min. A maximum speed of 110 km. (68·2 m.)p.h. will also be allowed for these trains.

U.S.S.R.

Moscow Institute of Railway Transport

Scientific research work conducted by the Railway Transport Institute in Moscow, is proving an important factor in the reconstruction and extension of the Soviet railway system. Some 700 scientific workers are engaged in putting into practice the instructions of the Commissariat of Railways, the decisions of departmental meetings and the experience of the best workers in transport.

Intermediate Coupling Device

One of the important devices brought out by the institute enables vehicles fitted with the new automatic couplings to be attached to others equipped with the old screw link coupling. The importance of this may be realised when it is stated that in 1937 over 50 per cent. of the freight rolling stock of Soviet railways (tens of thousands of freight cars) will be equipped with automatic couplings.

Another useful invention of the institute is a new type of tank wagon for bitumen which can be emptied in 30 minutes. Bitumen solidifies in cold weather and the unloading of an ordinary tank car takes from five to eight hours. About 800,000 tons of bitumen will be carried by the railways in 1937, and consequently, the new type of car will be very valuable. Problems brought forward by individual railways are studied by the institute, and goods traffic is analysed. Intensive work is being done on standards for car springs.

The institute is also investigating many problems arising out of the speeding up of traffic on certain main lines where trains will travel at a speed of 40 km. an hour instead of the present average of 19·4 km. Important centres are to be connected with lines carrying high speed traffic.

JAPAN

New Lines in Rural Districts

The Government Railways have completed preliminary plans for the construction of 923 km. (572 m.) of new lines in the rural districts of Honshu and Hokkaida Islands, most of them in the latter. The construction will be spread over seven years and it is hoped that these works will assist in giving relief in the distressed agricultural areas.

New Railway Link in Shikoku Island

There is still a number of isolated sections of the Government Railways in the several islands of Japan. These sections are being gradually brought into direct communication with the principal railway system in each island, and on November 28 last a new link was opened through a mountain range between Awa-Ikeda and Osugi, to connect an important section of line along the south coast of Shikoku Island—of which Kochi is the centre—with the main system of the island in the north.

BELGIUM

Improving Goods Traffics

Some notable symptoms of trade recovery are shown by the recent increase in the goods traffic carried by the Belgian National Railways. During the week from December 30, 1935, to January 4, 1936, 5,699 truckloads of coal were registered, an increase of 45·6 per cent. compared with the corresponding period in 1934. For other kinds of goods 9,537 trucks were loaded, showing an increase of 17·05 per cent. over 1934. The total number of trucks is thus 15,236, corresponding to an increase of 26·6 per cent. greater than the 1934 figure. It should be noted that this increased traffic has taken place at a period when generally the carriage of goods is slowing down. Further, the number of loaded trucks from foreign countries was 3,375, an increase of 12·6 per cent. The grand total for the week under review is thus 18,611 wagons, or an increase of 23·8 per cent. on 1934.

CHINA

Hwainan Railway

The permanent way has now been laid from Chaohsien into Yuchichen, the southern terminus of this line situated on the north bank of the Yangtze opposite Wuhu, and it is expected that the line throughout from the Hwainan coalfield, on the Hwai-ho, to the port of Wuhu, will be opened for coal traffic shortly. Even though railhead has been at Chaohsien, and the remainder of the journey to the Yangtze has had to be made by road, the export of Hwainan coal has increased considerably during the past year. Wuhu is a port for both ocean-going and river shipping.

After a lapse of four years, through goods traffic between North China and Manchukuo is to be resumed, if the agreement reached between the authorities of the two countries receives the approval of the Nanking Government.

BRAZIL

Central Railway Electrification

The placing of the important contract with Metropolitan Vickers Electrical Export Co. Ltd. for the electrification of the Central Railway of Brazil has already been reported in the Contracts and Tenders columns, and articles giving descriptions of the proposed works have appeared from time to time in the Overseas pages, or in the *Electric Railway Traction Supplement* to THE RAILWAY GAZETTE. Good progress is being made in the construction of buildings for carsheds, workshops and substations, also foundations for the overhead equipment of the tracks, and material from the works has begun to arrive in Brazil.

Visit of Sir Felix Pole to Brazil

An event of importance in connection with this contract is the visit to Rio of Sir Felix J. C. Pole, Chairman of the Associated Electrical Industries Limited, and Mr. P. S. Turner, Chairman of Metropolitan Vickers Electrical Export Co. Ltd., both of whom arrived on January 10. During their visit they will have audiences with the President of the Republic,* Ministers of Transport and Finance, as well as with the Governor of the State of S. Paulo, and later will visit the cities of S. Paulo, Montevideo and Buenos Aires before returning to England.

* This audience was recorded on page 126 in our Notes and News columns last week. A luncheon was also arranged as a welcome to them on their arrival, particulars and a group photograph of which will be found in our Personal columns on page 159.—ED., *R.G.*

THE VARIED RESPONSIBILITIES OF A RAILWAY ELECTRICAL ENGINEER

*As a typical example of the scope of an electrical engineer upon a British railway, the career and experience of Mr. J. Dalziel, the recently-retired Assistant Electrical Engineer of the L.M.S.R., are recorded in the article of which the instalment below is Part II**

Miscellaneous work up and down the railway done under Mr. Dalziel's charge included, as well as new work of the classes already indicated, numerous steam to electric and some steam to suction gas and oil engine conversions, especially in the case of pumping plants, locomotive-water and hydraulic-power supplies, cranes—largely yard Goliaths—and out-station fitting and machine shops. Various power stations were also converted to public supply.

Water Trough Improvements

The Midland Railway first adopted track water troughs during Mr. Dalziel's early years at Derby. Those of his design at Hawes were the first fitted with steam heating for protection against frost. For the Tamworth troughs a new type of control gear was designed in Mr. Dalziel's office, utilising valve-operating relays as the primarily actuated control mechanism. This enabled both the size of the control tank and the flow required for control purposes to be so much decreased as to reduce the responsive time of valve movements from minutes to seconds, and to cut the refilling time of the troughs by 75 per cent. It also enabled independent control to be provided for each line so making the up and down lines independent both as to level and to the one depleting the other of water. Improvements in turntables and in engine-lifting appliances were also effected.

Mr. Dalziel also dealt with the plans of the first hot water washing-out plant on the Midland system and the first mechanical locomotive coaling plant. For the shops he propounded schemes for the new forge, the reconstruction of the heavy hydraulic forging presses, the rearrangement of the hydraulic power supplies, with compressed air supply, shop heating, &c.

Hydraulic Plant Conversions

The first hydraulic plant conversion was effected at Bristol, St. Phillips, in 1905, and included capstans, cranes and traversers. The most noteworthy in its results was that at Lawley Street, Birmingham, in 1915, where the consumption of pressure water was reduced to half by the conversion to electric drive of 7 of 26 capstans and 50-60 hydraulic appliances in total, the steam pumps being converted to electric for the remainder. There it was that the first of the Derby special capstans was installed. This was a conversion to public supply, and, from the electrical point of view, the most interesting feature was the supply of the old long-series circuits by constant current transformers in replacement of the Thomson-Houston constant current machines, 50-volt metal filament bulbs having already replaced the former arc lamps.

Except for a pump in the Carriage and Wagon Department at Derby, this Lawley Street installation, with its contemporary at Birmingham Central, was the first instance of the use by a railway—and one of the first anywhere in the country—of 3-phase variable speed commutator motors; these, though initially expensive, saved cost in switchgear and much wear and tear and maintenance by reducing starting and stopping; they also improved the power and load factors. Many conversions on similar lines followed on the Midland and later on the L.M.S., and are still taking place as the cheapening and availability of current supply justify them financially.

The changeover to Stonebridge Park of the Midland Railway London supplies, which had been distributed from Highgate Road at 2,000 volts d.c., was effected through two 2,000-volt rectifiers, so making use of the same distribution cables. This is believed to have been the first British railway rectifier installation; it was certainly the first with so high a d.c. voltage.

Electrification of Capstans, Cranes and Pumps

The first electrically-driven installation of any size on the Midland was that at Oakham provender stores in 1901-2, where most of the original plant, including many of the reconstructed capstans, is still running. These were the first electric capstans on the Midland and possibly on any British railways. The Midland Hotel, Manchester, followed with its lifts, laundry, ventilating and heating (with which Mr. Dalziel was partly concerned) and other driving equipment. Then came Heysham Harbour, where Mr. Dalziel was responsible for the Mond Gas Westinghouse power station, large battery, and lighting installations, as well as for the electrical and partly also for the mechanical portion of the electric capstans, cranes and other machinery. Mr. Dalziel was subsequently responsible on the Midland for various additions to the Heysham crane and capstan equipment from time to time, including two modern wharf cranes set to work in 1919.

Heysham Developments

The Heysham-Morecambe-Lancaster electrification—referred to more fully later—was opened to traffic at Easter in 1908, the power station having an additional gas engine of more modern type and two motor generators for the 6,600-volt traction supply installed. The original American-built engines, being worn out, were replaced in 1915, and Mr. Dalziel took the opportunity to eliminate some power-station losses by coupling the motor generators to the new engines through gearing. The arrangement was unique, as the traction demand, which occasionally reached 1,000 kW., was met from a 250-kW. generator by the d.c. machine, normally generating, being governed by regulators so as to change round to motoring from the battery. Later, when public 3-phase supply was adopted, the same arrangement was maintained and was of material benefit in keeping down peaks and improving the load factor so as to put the demand on favourable supply terms.

The next extensive work at Heysham was in 1926-7 in connection with the concentration at Heysham of the L.M.S.R. Belfast services when the South Quay sheds and cranes, &c., were reconstructed, and a new crane and a mechanical coaling plant installed. Some of the old cranes were reconstructed to suit the wider beam of the new steamers and the new jibs fitted with derricking gear: also one was moved.

The work had to be done without interrupting the existing services, and, as things turned out, its completion to time called for special effort. Late in the week prior to the opening for traffic, things were very behindhand, the erection of some portions of the new plants,

* Part I appeared in our issue of January 17.

including some of the heaviest, not having begun; even certain important foundations were not down. As the contractors were unable to offer completion in anything like the specified time, Mr. Dalziel took matters over himself. With the assistance of his staff and, by splitting up the work among different gangs borrowed from other stations and other departments and by working night and day, the whole of the work was completed ready for testing on the Sunday and for actual work on the Monday. Mr. Dalziel on behalf of himself and the staff under him received the thanks of the late Mr. Reid, the then responsible Vice-President, for the work done in connection with this job.

In other dock works subsequent to the amalgamation, Mr. Dalziel was responsible for a considerable number of cranes, capstans, traversers, impounding pumps, &c., at Grangemouth, Poplar, Garston, Barrow, Goole, and Ayr. The Grangemouth installation encountered some opposition at first, as the design, braking system, control, &c., were new to the users, but it was not long before the higher speed and otherwise efficient working results were fully appreciated. The Barrow cranes handling iron ore with grabs are also credited with record-breaking unloading speeds.

Steamer Equipment

Mr. Dalziel dealt also with the electric equipment of the new Heysham-Belfast steamers and of all later ships of the various L.M.S. services up to 1934. The equipments comprised generating plant, mainly turbo-driven, switch and distribution boards, electric lighting, steering gear, cargo handling cranes and derricks, capstans and windlasses. Later ships also included electric kitchens, automatic stokers and fire pumps. The 120 kW. load of the first three new Heysham boats, and the approximately 150 kW. of later ones contrasts with the 10 kW. to 20 kW. of earlier cross-channel steamers. Steamer cranes, derricks and capstans present similar problems of motor characteristics, control and braking to those on land, but under the differing conditions these problems had to be solved differently. For example, on the ships' cranes and derricks electric braking was used to a greater extent than the simpler mechanical methods on the higher lift wharf cranes; provision had also to be made by a combination of motor characteristic and control gear for efficient movement of widely varying loads. Steamer capstans and windlasses presented similar or even greater problems than on land, particularly those of maintained pull at slow speeds and with the motor stalled; with d.c. drive this had to be solved by automatic control.

Coaling Plants

In coal shipping plant Mr. Dalziel was responsible in 1909 for the largest Midland hydraulic coal hoist, the 30-ton hoist at King's Dock, Swansea. This was fitted with the then standard anti-breakage boxes and cranes, by means of which an initial deposit of coal was piled at the bottom of the ship's hold for the purpose of cushioning the main bulk of the cargo. Various other devices were tried in response to requests from the shippers, but nothing much more was heard of anti-breakage in connection with this plant until many years after its installation. The accessory plant of this hoist embodied various special devices evolved by the Derby staff, and the hoist was considered to be one of the fastest, if not the fastest, working in Swansea.

Preference for Conveyors

In Mr. Dalziel's view plant of the hoist type is not well suited to electric drive, and is also incapable of full utilisation of its amenities in the form of sub-divided and accessory operating gear. This opinion applies also to coaling cranes, with several of which also Mr. Dalziel had to do. These are slower than hoists but have advantages in respect of breakage. Therefore when the L.M.S.R. considered putting down additional coaling plants, conveyors were selected on Mr. Dalziel's recommendation, based on their more rapid, and greater ease and flexibility in, working.

Conveyors were put down at Glasgow, Ayr, Grangemouth and Swansea. Several of these plants are fitted with anti-breakers and, according to Mr. Dalziel's experience and opinion, are capable of anti-breakage results at least equal to those of cranes. Their layout for rapid working and minimum operating labour was entirely new and unusual, embodying among other features five-ton capstans (the heaviest so far used on British railways) with double ropes on spirally grooved bollards to eliminate paying-out, up-grade creepers, and automatic setting of the wagons on the weighing machines. Similar 5-ton capstans were later adopted by the L.N.E.R. for its trawler coal conveyor plant at Grimsby.

Mr. Dalziel was associated in its early stages with the trawler coaling scheme for Fleetwood now in hand, and also with schemes for several other plants not so far realised. Of late years, too, he had considerable experience with conveyors and other mechanical handling plant in goods sheds and warehouses.

Remarkable Cranes at Stoke

The cranes at Stoke goods shed may also be mentioned as being of a special mono-rail type and, to ensure continuity of service at particularly busy points, arranged to travel through points and pass each other on the decks, without, as is usual, having to wait for the return of a crane despatched loaded. They can also pass from deck to deck so as to concentrate if necessary on a specially busy deck. This installation was briefly described in THE RAILWAY GAZETTE of May 20, 1932. The jibs have a derricking motion to provide for variations in roof height and also to allow of their reaching into box vans. To simplify the current collecting gear the cranes are worked off low voltage negative earthed direct current supplied from the 3-phase main supply through a glass bulb rectifier—a good example of the application in practical work of the flexibility conferred by such apparatus. Incidentally it is also a good example of an instance where the machines concerned, without electrical conception, could not have been evolved.

(*To be continued*)

New 80-ton Cranes at Lahore

(*See illustrations on page* 155)

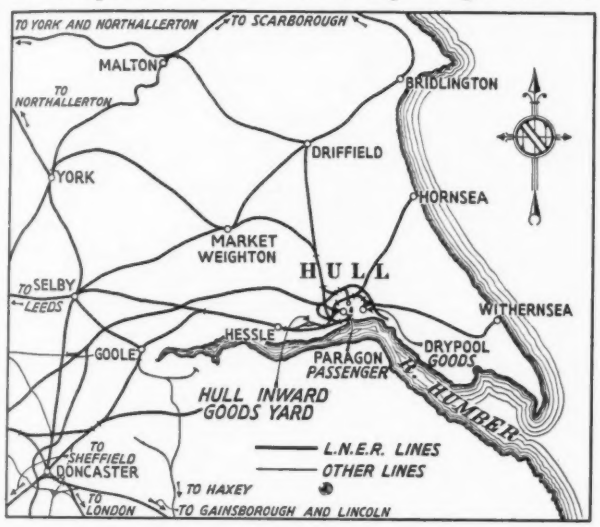
TWO new 80-ton overhead cranes have recently been installed in the erecting shop at Moghalpura (Lahore) locomotive shops, North Western Railway, India. They were supplied by Cowans Sheldon & Co. Ltd., of Carlisle, and were erected by the Bridge Department of the N.W.R., a representative of the makers being present to supervise the mechanical and electrical details. In common with all other machinery throughout the locomotive and also the carriage and wagon shops at Moghalpura, they are electrically driven, a feature of the equipment being the use of dead-man handles on all the controls. The cranes were each tested under a load of 100 tons, and in the illustrations on page 155 they are seen lifting the heaviest type of passenger engine on the railway, an "XC" 4-6-2. We are indebted to Mr. D. Cardew, Chief Mechanical Engineer, N.W.R., for permission to publish these notes and illustrations.

NEW MARSHALLING YARD AT HULL, L.N.E.R.

A hump yard at Hessle, near Hull, with the most up-to-date equipment, including hydraulic rail brakes, has recently been opened for dealing with inwards traffic

THE new hump marshalling yard at Hull, which, as we recorded in THE RAILWAY GAZETTE of December 13 last, was brought into use on December 9 last, provides the third example in this country of the use of power operated rail brakes, the previous two being Whitemoor Up and Down yards, near March, L.N.E.R. The new yard, which incorporates many distinctive features of operation, is designed to deal with 2,500 wagons a day—though upwards of 3,000 could be dealt with if necessary—and is used to sort the traffic, not only for the docks and goods stations in Hull, but also for branch line destinations to the north-east of the city such as Hornsea, Withernsea, and Bridlington.

The former inward goods yard at Hull consists of five reception lines and nine sorting sidings, and this



Key map

accommodation had to cope with an average of over 2,200 arriving wagons in 24 hours, and it was necessary to transfer traffic to other sidings for detailed sorting before despatch to destination. The new yard, which lies to the north of the main line, is entered at Hessle Haven junction, about ¾ mile east of Hessle station, and 5½ miles west of Hull, Paragon terminus. There are six reception sidings track-circuited throughout, each with standage for 100 wagons, the entry to which is under the control of Hessle Haven box; arriving trains, however, are routed according to the instructions of the hump yard inspector who communicates his requirements to the signalman at Hessle Haven by means of a switch that illuminates a number indicator in the latter box.

As trains arrive not only from the west and south but also from the branch lines north and east of the yard, up and down running lines are provided from the departure end of the yard at Dairycoates to the two southernmost reception lines, which may be used in either direction. To avoid delay to engines of incoming trains, those of trains arriving from the west and south can be liberated from one group while the hump pilot continues to push another train over the hump from another group. This arrangement is made possible by the provision of two engine departure lines, one on each side of the main group of sidings.

Beyond the sorting sidings are four departure lines which form the termination of the yard, and to the north of the main sorting sidings and of these departure lines, a secondary group of six sidings, each with a minimum standage of 18 wagons, is provided for the further sorting of local traffic. An engine pit and three water columns, and a dock for dealing with cattle are also provided.

The construction of the yard has involved the dumping of 7¼ million cu. ft. of filling, all of which was obtained from a quarry in the side of a railway cutting 60 ft. deep at Kirk Ella, five miles away. In preparing the site, the Fleet drain was diverted for a length of 230 yd., entailing 135,000 cu. ft. of excavation. In the yard itself the total length of permanent way is 24¾ miles, of which point and crossing work accounts for five miles. The total length of the new yard is 2 miles 9 chains, and standage is provided for 2,700 wagons in two main groups of six reception roads and 30 marshalling sidings.

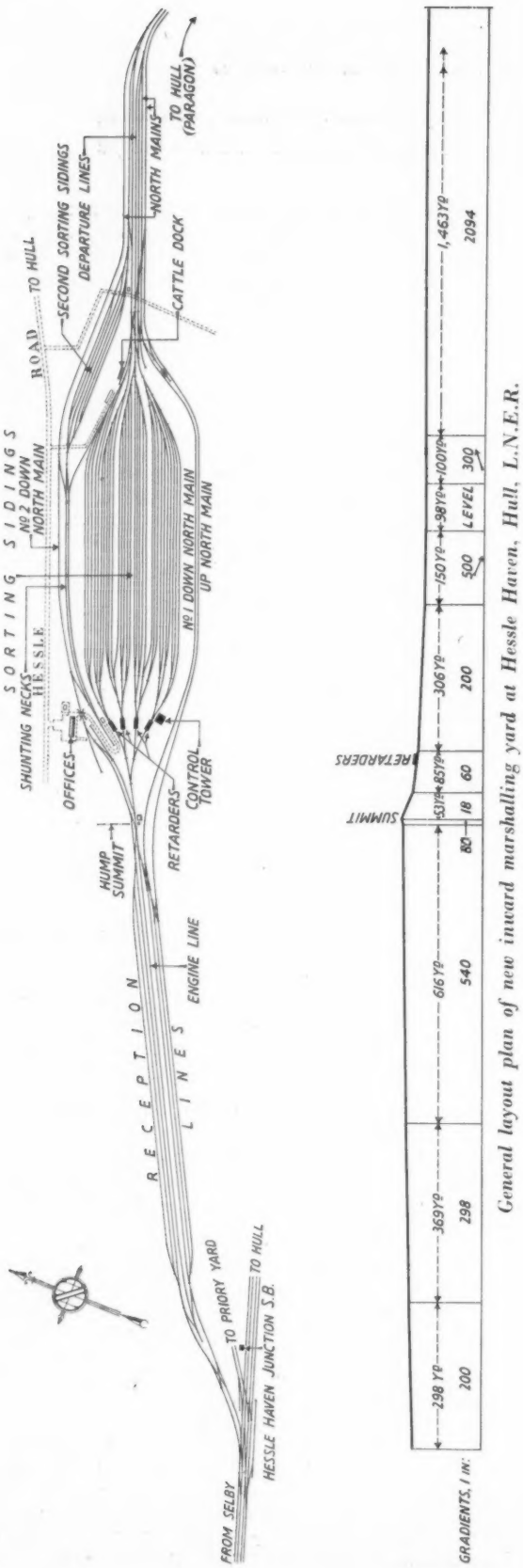
Four hydraulic rail brakes of the Frölich type are provided, but, unlike the previous two installations, the points are operated electro-pneumatically. Point setting is accomplished by means of route buttons working on the relay interlocking principle. Normally de-energised track circuits have been adopted, and these are energised when occupied by a cut of wagons. When energised they lock the points and also give an indication on the panel.

Rail Brakes

Details of the rail brakes are given in the drawings showing the cross section of the brake and a longitudinal view. It will be noticed from the cross section that renewable wearing pieces are provided on all four braking rails. This is an improvement on the Whitemoor brakes where no renewable wearing pieces were provided on the outer braking rails. Consequently on the Hull brakes the replacement of worn rails is cheaper and more easily accomplished. Further it is to be noted that the adjustment of rails to compensate for wear is improved by the provision of a large horizontal screw arrangement which is shown attached to the support of the outer rails. This is in lieu of adjustment by means of packing pieces as used on the Whitemoor brakes.

The longitudinal view of the brake shows the arrangement of the braking beams on the steel understructure, and it will be noticed that six lifting cylinders are provided. At Whitemoor there are seven lifting cylinders. The braking beams are continuous rolled sections each 75 ft. long. All bearings are fitted with lubricators for high pressure gun lubrication. The brakes were completely assembled in the factory, and so delivered and installed with the use of the cranes.

The control of the rail brakes is similar to that at Whitemoor Up yard. The fluid used is water to which is added a percentage of glycerine for winter working. This enables the anti-freezing system used in the earlier installation to be dispensed with. The latter was described in full detail in THE RAILWAY GAZETTE of September 20, 1929. In



General layout plan of new inward marshalling yard at Hessle Haven, Hull, L.N.E.R.

the present instance, however, the controls are so arranged that all four brakes are operated by one man, whereas at Whitemoor one operator handles only two brakes. This is effected by placing the control valves in the pump room, on the lowest floor of the control tower, and actuating them by down rods from levers in the control room.

The maximum hydraulic pressure which can be applied to the rail brake cylinders is about 1,600 lb. per sq. in. The normal method of working, however, is to set the control lever so as to give about 400 lb. per sq. in. until a wagon has actually entered the brake; then the pressure is quickly increased to give the desired retardation, which depends on the weight of the cut passing through. It is rare that more than 1,000-1,200 lb. per sq. in. is necessary, so that there is a considerable amount of power in reserve. The brakes have already dealt successfully with cuts up to 47 loaded coal wagons.

The Control Tower

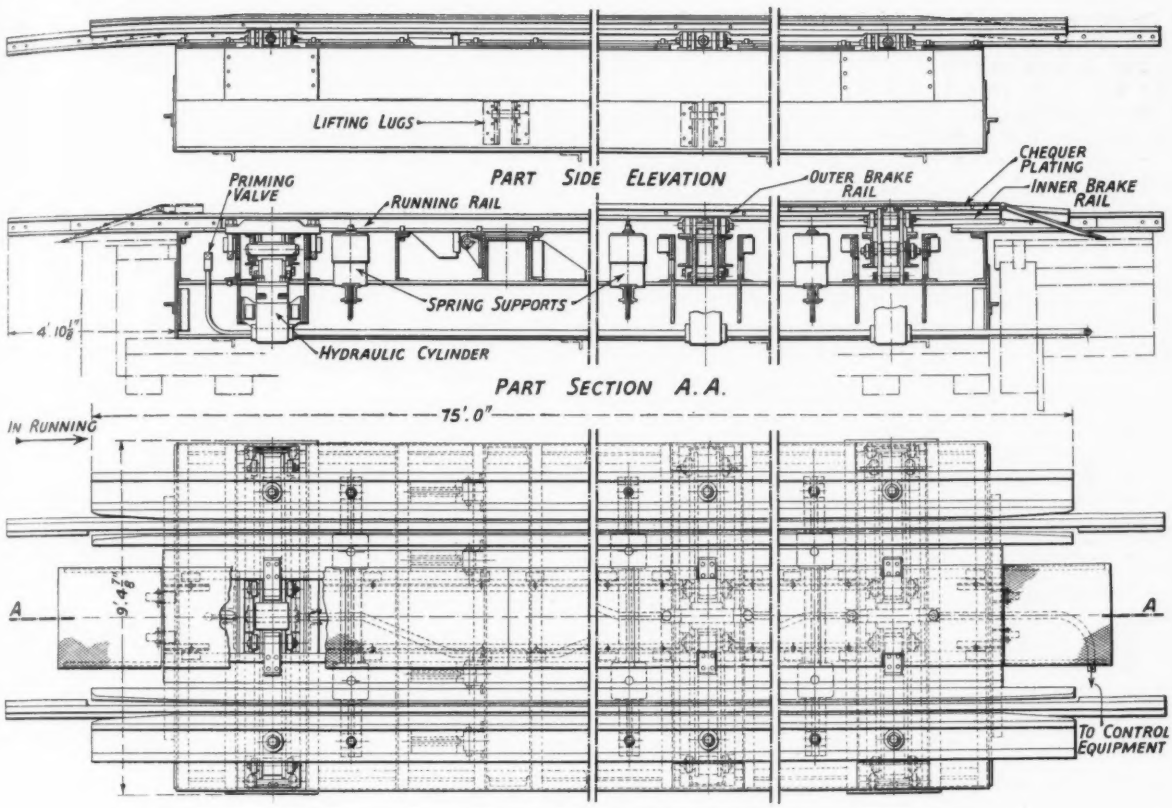
Unlike those at the two yards at Whitemoor, the control tower is placed at one side of the tracks. This arrangement gives a very fine look-out for the operator in charge of the rail brakes. The tower is situated adjacent to, but slightly below the brakes. The control room is glazed from ceiling to floor on three sides, and the brake control levers are placed at the end nearest to the hump. The point control panel is at the opposite end. The rear of the tower is occupied by the hydraulic accumulator and the stairs and landings leading to the various floors, while in the semi-basement which extends on each side of the main tower are the air compressors and the hydraulic pumps. The relay room is situated in the front, immediately below the control room.

The tower is a striking example of modern railway architecture, in the same pleasing style as the new signal box at Thirsk, but in this case the flat roof is extended over the windows of the control room to provide a generous awning. The tower is carried on 15 concrete piles, each 20 ft. long.

Point Operation and Mechanism

The control panels top consists of an illuminated diagram of the yard, along the lower edge of which is a series of push buttons. Each button, when operated, sets up a complete route from the hump to one of the thirty sidings. Before humping begins, the operator receives a card, by pneumatic tube from the cabin at the top of the hump, giving a list of the destinations of each group of wagons. The route can then be set for the first group, or cut as it is generally called, by pressing the appropriate button. The next route cannot be set, however, until the first cut has cleared the king points; as soon as this takes place a green lamp on the diagram indicating " next route clear " is lighted, and a buzzer sounds simultaneously. The second route can then be set up, the first route button having been released by the occupancy of the king track. Mechanical interlocking is provided between the buttons to prevent more than one being depressed at a time, while each button is mechanically latched in its depressed position until the king track is occupied.

In addition to this route working, individual control is provided for every pair of points, by means of small thumb switches placed at the correct position on the illuminated diagram. These thumb switches, which have three positions, stand in their mid position for route working, but when individual operation is required, such as for light engine movements, a separate button is depressed which cancels all route working; the points can then be operated by their particular thumb switch. The way in which each pair of points is lying is indicated on the diagram by yellow lights, while the passage of a wagon over each track circuit is indicated by red lights, so that

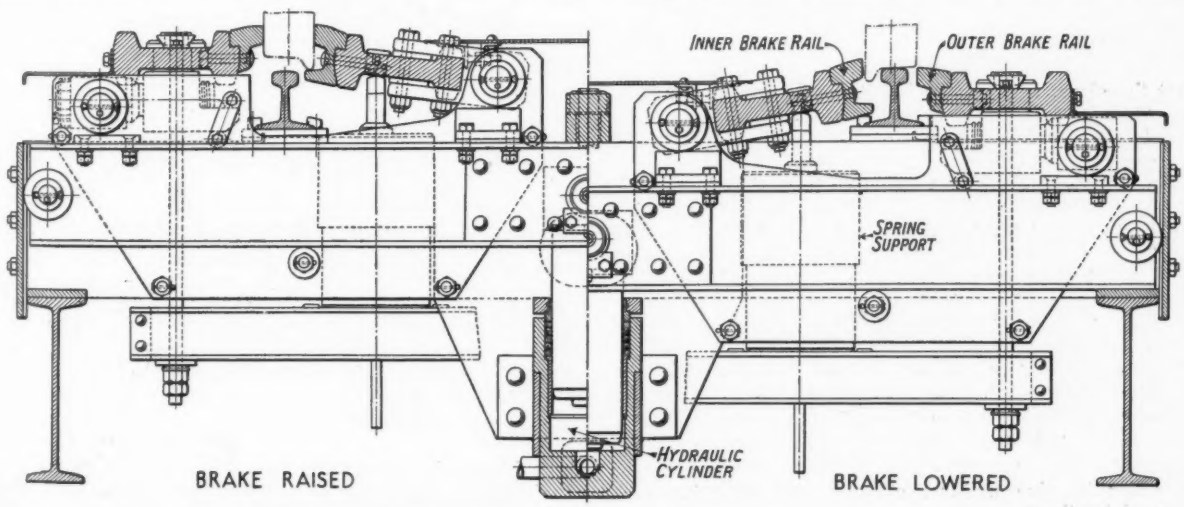


Side elevation, sections, and plan of hydraulic rail brake

the operator can follow the progress of any cut through the yard.

The diagram itself consists of a single plate of brown oxidised bronze, on which all the tracks and lettering are engraved. This colour scheme combined with chromium plated push buttons gives the control desk a most attractive appearance. The desk top is arranged to hinge from the front; the contacts and wiring can thus be examined from the back without interfering with the operation of either the push buttons or the thumb switches. The wiring is arranged in the form of a flexible tree, so that no disconnecting is necessary in order to open the desk.

The setting of each route is carried out entirely by means of relays, whereas in the two yards at Whitemoor magazine drum storage is used. Provision is made for the storage of routes through the non-track-circuited area represented by the rail brakes by means of special circuit arrangements, which permit of two separate cuts traversing the rail brakes at the same time. The whole of the route-setting apparatus is contained in two slender steel cabinets



Cross sections of hydraulic rail brake

in the relay room, while a third cabinet houses the track relays. In view of the complexity of movements involved the gear is very compact.

As there is no need for a facing point lock, the piston of the pneumatic point cylinder is coupled direct to the first stretcher bar making an extremely simple layout; the electric point detector is also directly coupled to the stretcher bar. Air supply to the cylinder is controlled by means of an electro-pneumatic diaphragm, thus securing very rapid working, while ample ports give an equally free exhaust. The whole has proved an extremely speedy mechanism. Under individual operation, by means of the thumb switches on the panel, the points are thrown and the new indication received in just under half a second after the operation of the switch.

Power Supply

The supply of electric energy to the yard is obtained from the Hull Corporation at 6,000 volts, three-phase, and is transformed down in a transformer substation on the far side of the yard to 400 volts, 50 cycles, three-phase. This pressure is used without any reduction for driving the hydraulic pumps and the air compressors. Each pump is driven by a 35-h.p. 3-phase induction motor; only one pump is used at a time, the second being kept as a standby. Automatic cut-in devices are fitted so that a constant pressure of about 1,600 lb. per sq. in. is maintained in the hydraulic accumulator. Each air compressor is driven by a 5-h.p. 3-phase induction motor; only one compressor is in use at a time, the second being used as a standby, and air pressure maintained at about 40 lb.

For the point operating gear, step-down transformers reduce the pressure to 110 volts, which voltage is used for point detection. The point control relays and the point valves, however, operate on 24 volts d.c. and are fed from batteries trickle-charged from the 110 volt a.c. supply through a metal rectifier. In a similar way, a second rectifier charges a 12-volt battery for the track circuits.

Floodlighting

Traffic is usually very heavy during the night hours, and in consequence floodlighting is used to give good visibility. The lighting was designed to provide intensive illumination round about the hump, the rail brakes, and the points giving entry to the yard, the sidings themselves remaining unlighted. Similar, though less intensive lighting is also provided at the exit of the sidings.

In arranging this lighting consideration was given to the elimination of as many posts as possible. This of course could have been achieved by the installation of horizontal floodlighting units alone, but experience of such units in several other yards on the L.N.E.R. indicates that the glare, which is an inevitable feature of this type of floodlighting, is detrimental to safe operation of marshalling yards. The use of these units therefore has been reduced to a minimum.

The floodlighting units, two of which are double-banked, are of the 1,000 watt weatherproof type and are mounted on the top of 55 ft. steel poles equipped with ladders and platforms for maintenance purposes. The poles are of mild steel hollow rectangular section with rounded corners, and are tapered from the base upwards and welded continuously throughout their length. They are so constructed as to be airtight and thus to prevent internal corrosion. To preserve airtightness, all attachments are made by passing bolts through tubes welded into the poles. These poles are easily erected and neat in appearance. In the yard 500 watt lanterns on similar poles about 30 ft. long are used. The positions of the units have been arranged in order to give uniform candle-power over the area covered by them.

In order to increase the illumination directly over the rail brakes, and at the same time to eliminate the planting of further poles in the vicinity, one of the double floodlighting units referred to above has been placed in position alongside the control tower so that its light strikes the trucks passing over the brakes more or less at right angles, and has the effect of showing them up in sharp relief to the observer in the control tower.

Underground cables have been laid to all the lighting units at the hump end of the yard so as not to obstruct the vision by overhead lines. At the outgoing end of the yard the wiring has been carried mostly by overhead conductors. The lighting is balanced as far as possible across the three phases of the 400 volt a.c. supply. That the illumination has been effectively carried out will be evident from the accompanying photographs.

General Features

A microphone is fitted near the point control desk by which the traffic controller can give instructions through loud-speakers installed at widely separated points in the yard. This microphone can also be switched over to a loud-speaker in the yard inspector's office at the top of the hump in which another microphone is fitted through which the shunter there can talk to the control room. To facilitate communications between the various offices and signal boxes a fifteen-line automatic telephone exchange has been installed.

The speed of humping required is indicated to the driver by means of a three-aspect searchlight signal on which the green aspect signifies "hump fast," and yellow "hump slow"; red of course indicates "stop." The signal is operated from a switch in the yard inspector's office at the top of the hump, but control is provided so that the signal can be put to danger at any time from the control tower.

The yard is laid out in the attractive manner which has become characteristic of the lineside in the North-Eastern Area of the L.N.E.R. The ballasting is neatly edged with concrete; the V-shaped spaces between the rail brakes are filled with grass plots, and these features combined with the handsome design of control tower give the layout a distinctly elegant appearance.

Nearly opposite the control tower to the north of the hump an office for the yardmaster and his staff has been built. Its design reveals the skilful hand responsible for the control tower, and indeed for much of the other pleasing architectural work in the North Eastern Area. The internal arrangements are such as to promote the morale and self-respect of the staff. Accommodation for supervising and shunting staff is also provided at both ends of the yard.

The layout of the yard and the control system were designed to the requirements of Mr. C. M. Jenkin-Jones, Superintendent, North Eastern Area, London & North Eastern Railway. The installation of the rail brakes, which with their control gear, were manufactured in this country, was carried out to the instructions of Mr. H. N. Gresley, Chief Mechanical Engineer, by Rail Brakes Limited—a subsidiary of the General Railway Signal Co. Ltd.—to whom Henry Berry & Co. Ltd. and Francis Morton & Co. Ltd. were sub-contractors; Mr. Gresley was also responsible for the lighting, the floodlighting units being supplied by the General Electric Co. Ltd., and the poles by Imperial Chemical Industries Limited, for whom they were manufactured by the South Durham Steel & Iron Co. Ltd. The Westinghouse Brake and Signal Co. Ltd. were responsible for the installation of the point operating gear and track circuits, to the requirements of Mr. John Miller, Engineer, and to the designs and under the supervision of Mr. A. E. Tattersall, Signal and Telegraph Engineer.

The control tower

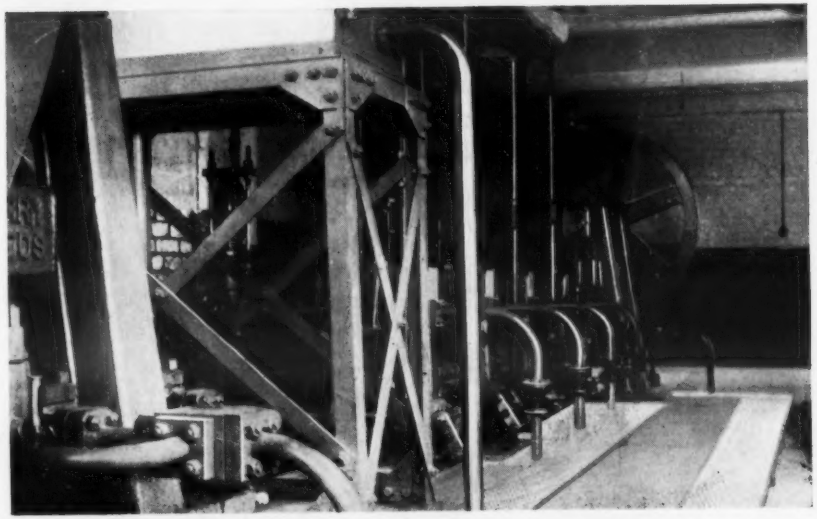
Night view showing floodlighting

NEW INWARD MARSHALLING YARD AT HULL, L.N.E.R.

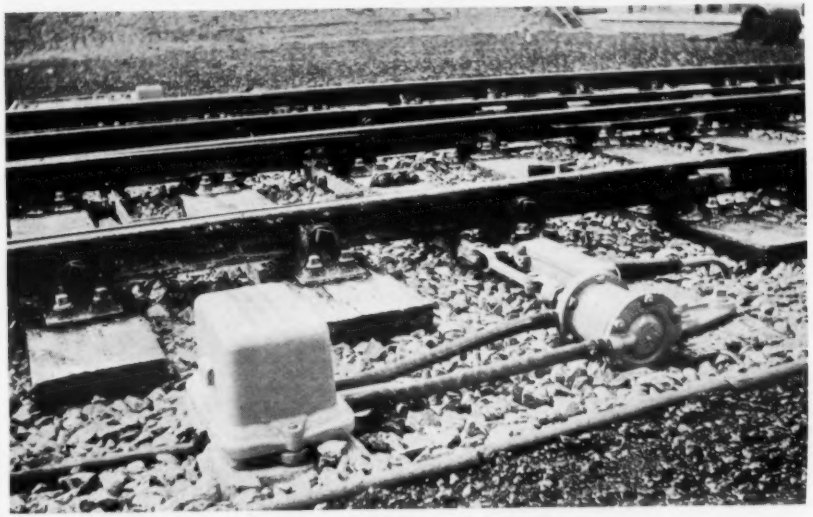
(*See article on page* 145)

Yard inspector's office at top of hump

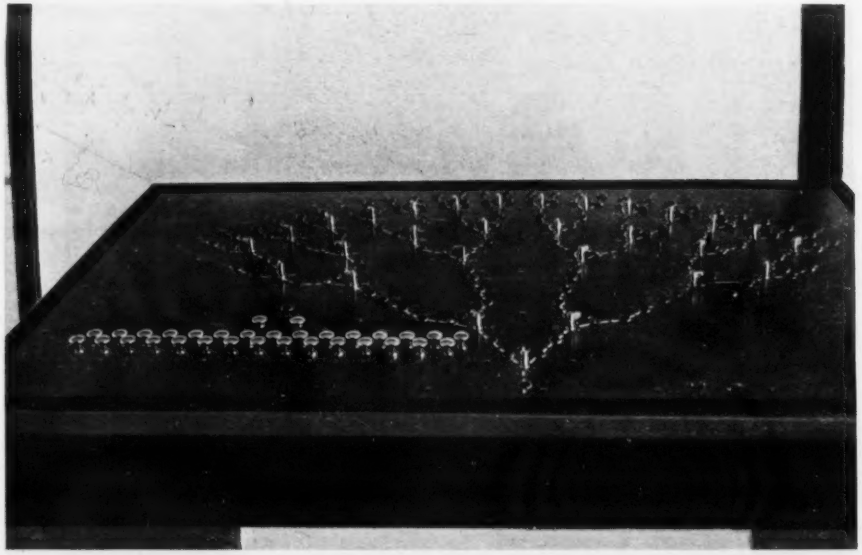
One of the hydraulic rail brakes



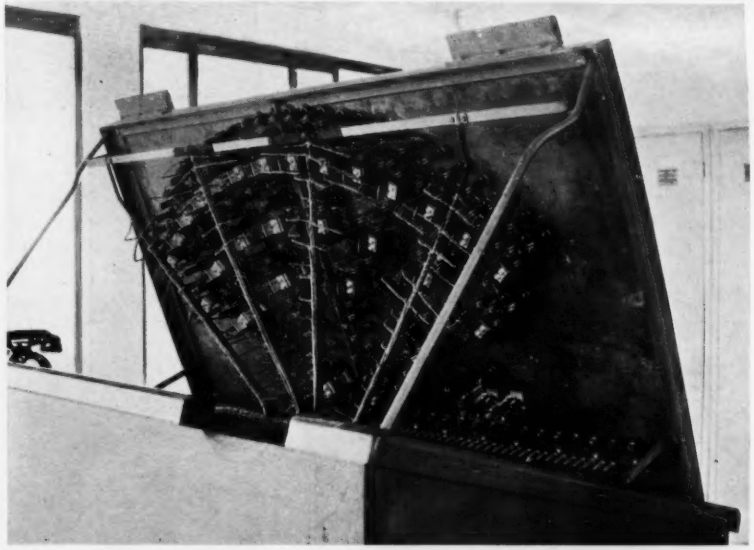
Hydraulic pumps



Electro-pneumatic point mechanism



Control panel



Rear of control panel in raised position

Brake control levers

Point control desk

Inside control room at night

NEW INWARD MARSHALLING YARD AT HULL, L.N.E.R.

(*See article on page* 145)

Above: The inward yard looking up the hump. Below: General view of the yard from above the hump

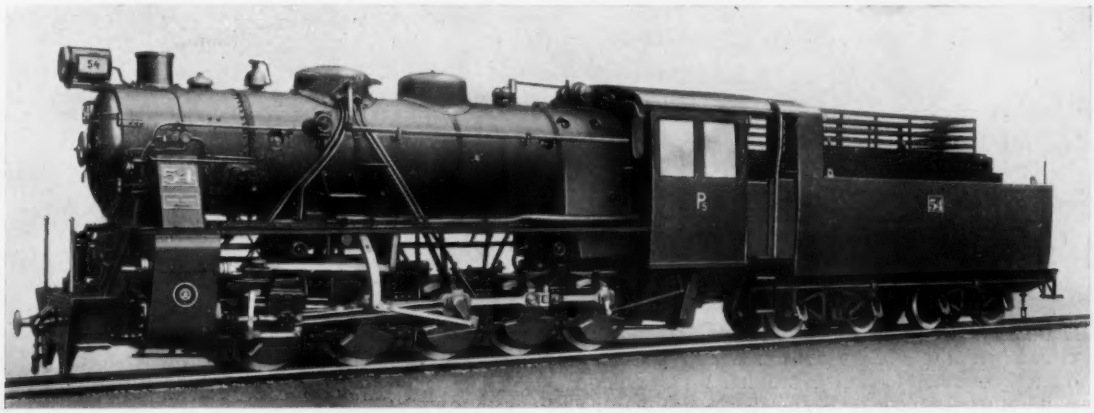
NEW INWARD MARSHALLING YARD AT HULL, L.N.E.R.

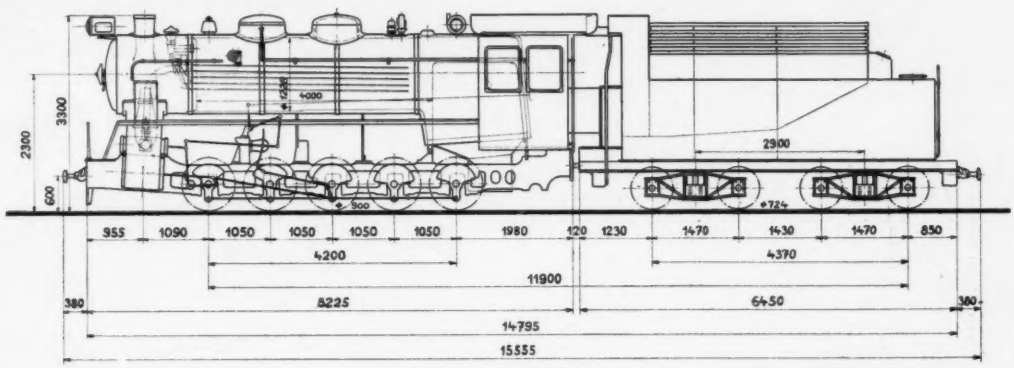
(*See article on page* 145.)

NEW 2 FT. 6 IN. GAUGE 0-10-0 TYPE LOCOMOTIVES FOR THE LITHUANIAN RAILWAYS

These engines, built by the Skoda locomotive works, have recently been placed in service

THE service conditions on the new 2 ft. 6 in. gauge sections of the Lithuanian Railways created a demand for a modern type of locomotive capable of hauling trains having a minimum weight of 300 tons on gradients of 1 in 62 at a speed of 12½ m.p.h.; curves of 657 ft. radius have to be negotiated on this section, whilst the engine must also be capable of hauling trains coupled wheels is 3 ft. 0 in. There are two single-expansion cylinders measuring 17¾ in. diameter by 17¾ in. stroke. The boiler carries a working pressure of 199 lb. per sq. in., and at 85 per cent. of the pressure the tractive effort is rated at 26,455 lb. The boiler is of the parallel type, and the inner firebox is of copper. The mean diameter of the barrel is 3 ft. 11¼ in. and the





General view and dimensioned (metric) drawing of Skoda-built 2 ft. 6 in. gauge Decapod locomotive for Lithuania

of 350 tons loading at a speed of 25 m.p.h. on gradients of 1 in 200 where the track is straight. Another condition was that the axle load must not exceed 7½ tons, whilst the firegrate and boiler dimensions were to be such that an adequate supply of steam could be maintained when burning mixed fuel, namely coal and wood. In order to secure the performance demanded, it was considered necessary to use ten coupled wheels, and as the maximum speeds called for did not exceed 25 m.p.h., no additional uncoupled wheels in the forms of bogies or trucks were included.

Although mixed fuel was to be used, efforts were made to avoid anything in the nature of a departure from the normal type of boiler, and by raising the boiler centre line high above the rails a sufficiently deep firebox was secured, located above the wheels. The diameter of the thickness of the plates ½ in.; the distance between the tube-plates is 13 ft. 1½ in.

There are 57 boiler tubes 1¾ in. diameter, and 34 flue tubes 3½ in. outside diameter. The heating surface of the firebox in contact with water is 70 sq. ft., and that of the boiler tubes and flues 753·5 sq. ft., giving a total of 823·5 sq. ft. The superheater surface amounts to 247·5 sq. ft. The grate area is 19·4 sq. ft. and the firebox has a volume of 63·6 cu. ft. The staying of the copper firebox in the water space is effected by means of copper stays, and above the water space by steel roof stays. The ashpan is of welded construction and the boiler riveting is carried out by means of the well known Skoda pin riveting system, all stayings for boiler mountings being welded to the boiler.

The total wheelbase of the engine is 13 ft. 9⅜ in. and

the rigid wheelbase, which includes only the distance between the first and fourth pair of coupled wheels, is 10 ft. 4 in. The rearmost coupled wheels are allowed side play, whilst the second pair are turned 2 in. undersize. The locomotives have a four-point suspension with the leading and second pair of coupled wheels forming the two front points, whilst the remaining three pairs of coupled wheels form the two rear points.

The valve motion is of the standard Walschaerts type with inside admission piston valves; reversing gear is of the screw pattern. The Skoda steam brake acts on all the coupled wheels, the brake rigging being equalised. The drawgear consists of a combination of a central buffer with hook and links balanced by equalisers. The sanding mechanism is hand-operated, and the foremost and third pairs of coupled wheels can be sanded either at the front or at the back. Electric lighting equipment is provided, a turbo-generator of 500-watt capacity being placed in front of the cab.

Among the fittings applied to these engines are the Friedmann live steam and exhaust injectors, Siemens pyrometer, Latowsky bell, and Klinger water gauges. The maximum permissible axle load called for a light but strong construction of the tender, and for this reason the tank frame and bogies are all-welded, so that considerable economy in weight has been effected. The water capacity is 2,450 gallons, and a fuel space of 318 cu. ft. is provided. Fully loaded the tender weighs 25·5 tons. It is carried upon two four-wheeled bogies having diamond pattern frames. The diameter of the wheels is 2 ft. 4½ in., and the wheelbase is 14 ft. 4 in. The total wheelbase of the engine and tender is 39 ft. 0½ in., and the over-all length 51 ft. The engine and tender in working order weigh 63 tons.

The locomotives have been subjected to trial runs on the Lithuanian Railways, in the course of which it was found that they were capable of exceeding the performance asked for in the specification. On a gradient of 1 in 50 with curves of 657 ft. radius the engine hauled a train of 300 tons at a speed of 11¾ m.p.h., and on a gradient of 1 in 200 the speed was 22½ m.p.h. with a train of 450 tons.

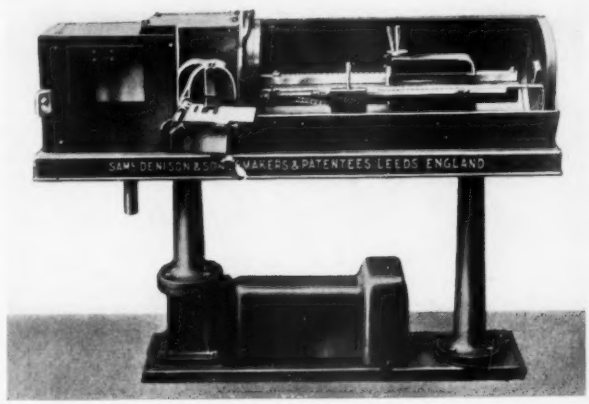
A NEW HORIZONTAL SPRING SCRAGGING MACHINE

This product of Samuel Denison & Son Ltd., Leeds, has a total capacity of 30 tons and possesses a number of outstanding features of design and construction

THE Denison horizontal spring scragging machine described herewith is of the self-contained type mounted on a baseplate, to which are fixed the cylinders, pumps and other components. The electric motor runs at constant speed and drives a main Hele-Shaw rotary oil pump. In addition the motor drives an auxiliary pump which is used to operate the control. The main pump is controlled by a double-acting cylinder, fed by the control pump, which in turn is controlled by a hand lever at the front of the machine. The movement of the tup is controlled in regard to direction, speed, and length of stroke by a hand lever fixed to the anvil block, and a locking catch is fitted to hold the lever in a neutral position. The use of the hunting lever system automatically reduces the stroke of the control pump until it becomes zero when the main pump has received the intended amount of stroke. Advantage is taken of the energy stored in the spring at the end of the loading stroke to push back the tup, thereby ensuring a quick return, the speed during the return being regulated by means of a throttle valve operated by a hand lever.

The tup travels backwards and forwards in a machined slide having renewable strips, and the anvil block is cast integral with the baseplate and provided with a loose steel face on which the slipper blocks for laminated springs slide. The tup has a protruding top to lip over the spring when scragging, and thus prevent its lifting.

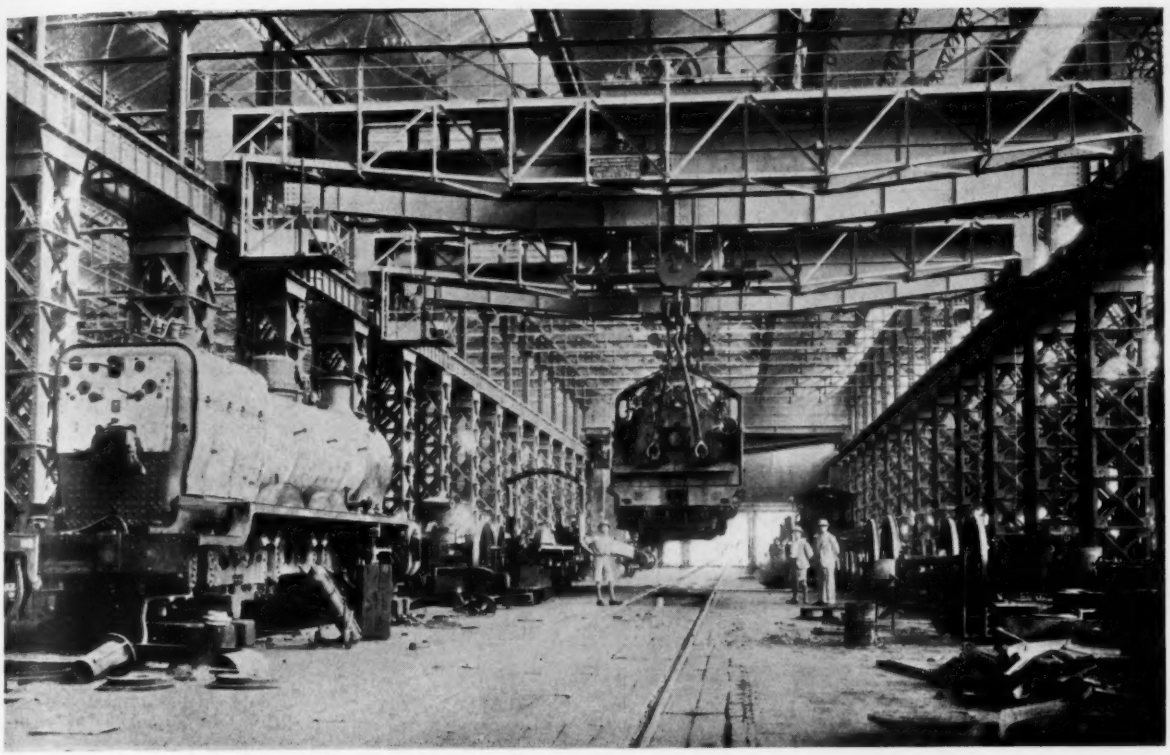
Three cylinders are provided, the main one having its ram permanently fastened to the tup. This ram is actually a piston, fluid being supplied to one side for loading and the other side for returning. Two additional cylinders are fitted, each having a capacity of 7½ tons, and when these rams are also connected to the tup the capacity of the machine is 30 tons. When the rams are connected to the cylinders they are out of commission, and the machine thus functions as a 15-ton machine. The speeds are as follows: 70 complete scraggs of 4 in. stroke per min. at 15 tons capacity, and 40 complete scraggs of 4 in. stroke per min. at 30 tons capacity. The drive from the motor to the auxiliary pump and to the leakage pump is by a bush roller chain. The auxiliary pump is connected to the control cylinder and to a valve box carrying suction and safey valves for each side of the system. The valve boxes are attached to the underside of the tank, and the latter is arranged so as to give a slight head of oil to all the parts.



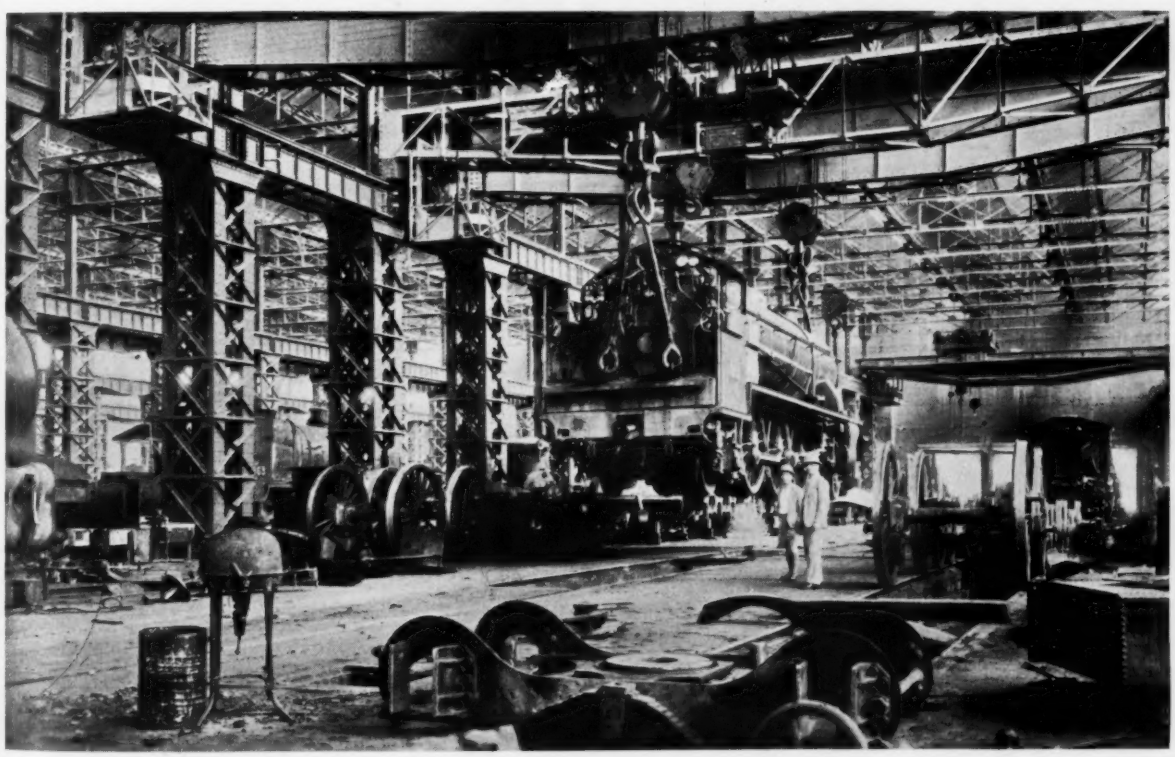
Denison spring scragging machine

The Denison patent by-pass valve is mounted in the main valve box to permit of the rapid return of the tup. The working fluid is oil, since this ensures perfect lubrication of the parts.

NEW RAILWAY IN JUGOSLAVIA.—A new line from Veles to Prilip, 85 km. (53 miles) long, built by a French company, has just been opened, states Reuters Trade Service from Belgrade. The line has 18 tunnels, the most important of which is the Babuna with a length of 2,600 m. (over 1½ miles). The new line was opened by General Nicolajevitch, the representative of the King, in the presence of the Ministers of Communications, Public Works, Mines and Forests, and many others.



Interior of locomotive erecting shop at Moghalpura, Lahore. The two new cranes shown lifting an XC heavy 4-6-2 type locomotive were recently supplied by Cowans Sheldon & Co. Ltd., Carlisle



Nearer view of the locomotive and lifting gear, which is electric. These cranes were erected by the Bridge Department of the N.W.R. (*See page* 144)

TWO NEW 80-TON OVERHEAD CRANES AT MOGHALPURA WORKSHOPS, N.W.R. (INDIA)

New twelve-wheeled first class kitchen dining-cars, London Midland & Scottish Railway

Looking through the smoking and non-smoking compartments towards the kitchen section

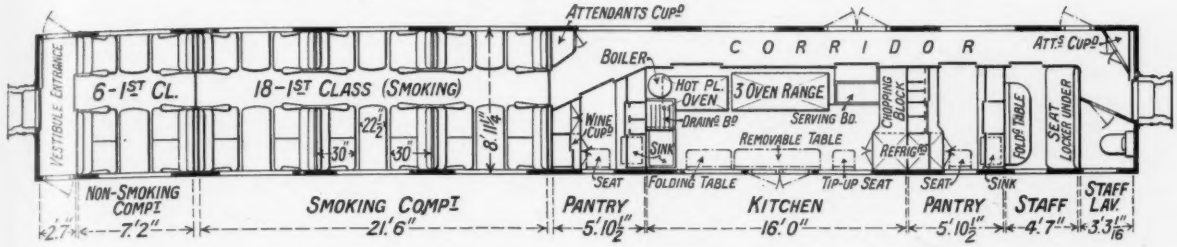
Interior of kitchen

Double seats in smoking saloon

NEW FIRST CLASS KITCHEN-DINING CARS, L.M.S.R.

NEW FIRST CLASS KITCHEN-DINING CARS, L.M.S.R.

These vehicles, built at the company's works at Wolverton, have recently been introduced in the principal main line services



THE London Midland & Scottish Railway has recently put into service several new first class kitchen-dining cars built at its Wolverton works. These vehicles, which measure 68 ft. 1 in. in length, are mounted upon two six-wheeled bogies. The dining compartment is divided into two saloons, one smoking compartment for 18 passengers and the other non-smoking compartment with accommodation for 6 passengers. Entrance is by means of two doors at the passenger end. The cars have a self-contained kitchen and two pantries with all modern culinary appliances. They are the same in all their principal features as those built in 1934, the main difference consisting of a different style of interior finish in regard to the timbers and veneers used and also the upholstery, whilst the extractor ventilators are of a double sliding and deeper pattern. The table lamps are now secured to the window sills and the kitchen is lined with stainless iron.

The underframe is constructed of rolled steel sections, the solebars, bolsters, headstocks and longitudinals being channels whilst the truss frames are of angle section. The bogies are fitted with steel helical concentric bolster springs and side laminated springs, the bottom centre casting and side bearing castings being fitted with lubricating pads. The body framing is of teak, and the sides, ends and roof are panelled in steel. The exterior is designed to give a flush finish, the lights being bedded up to the exterior steel panel. The bottom sides, pillars and rails, cantrails and roofsticks are bored to allow of air circulation between the body and roof panelling and inside linings. To minimise track and running noises the body is well insulated from the underframe by indiarubber pads, whilst in addition the compartment floor is made up of cork sheeting laid on galvanised dovetailed steel sheets.

The cars are finished in matt polished maple butt veneered multi-ply panelling with a cross banding of black walnut. The panels are all quartered, as also are the veneers on the seat ends to give a pleasing decorative effect. The doors, made of laminated plywood, are also veneered similarly with an edging of black walnut veneer. The seats have loose cushions and are designed to give comfort for both dining and ordinary seating requirements. Cellular latex fillings are used for the side arm rests and the pads below the windows. The saloons are artistically finished with shot blue and gold silk curtains and a rich carpet to tone with the upholstery which is of uncut moquette of pastel shades.

The kitchen contains a triple oven with grills above it, and is finished in white enamel and chromium plating. The hot water supply is by means of a circulating boiler connected to a storage tank above the stove, from which connections are made to the pantry and kitchen sinks. The tea boiler, fitted above the stove, is supplied with preheated water from the storage tank. The cold water supply consists of four tanks fitted in the roof with a total capacity of 200 gallons.

There are two pantries, one between the kitchen and the passenger compartment and another one at the further end of the kitchen. Both are fully equipped for their purpose. The walls and cupboard tops are covered with stainless iron and all cupboard doors are made of multi-ply panels. The corridor partition is of laminated plywood, stained oak and polished, and the body side of the corridor is panelled in 3-ply to give a flush finish. A special compartment is provided for the staff.

The lighting is by electricity, the main fittings being groups of lamps with attractive shades which in conjunction with special table standards attached to the sill and corner lights provide generous and artistic illumination. Sliding light extractor ventilators are fitted to each compartment window in the saloons. Variable speed extractor fans are fitted in the ceiling of the large compartment and one on the cross partition of the small compartment. In addition roof ventilation is provided by means of air extractors.

In the corridor adjacent to the kitchen and pantries air for ventilation of this portion of the car is induced by means of scoops arranged along the corridor body side in series to suit the direction of travel of the car. The air after passing through oil filters enters the corridor at floor level through grills in the body side.

The compartments are heated by steam heaters arranged along the body side with separate cut-off valves, and controlled by regulators fitted in the corners of the respective compartments.

The following were among those who supplied material and fittings used in the new coaches :—

J. W. Roberts Limited	Corrugated cork floor sheets.
A. G. Wild & Co. Ltd.	M.M. type ventilators and window sliding lights.
Visco Engineering Co. Ltd. ..	Air filters.
Brown, Bayley's Steel Works Limited	Stainless steel kitchen and pantry fittings.
Birmingham Railway, Carriage and Wagon Co. Ltd.	Buffers.
Turton Bros. & Matthews Ltd.	Concentric bolster springs.
George Spencer, Moulton & Co. Ltd.	India-rubber auxiliary bearing springs, draw and buffing springs.
Heatly & Gresham Limited ..	Gas cylinders.
Fletcher, Russell & Co. Ltd. ..	Kitchen range.
Lace Web Spring Co. Ltd. ..	Springs for seats and backs.
Joseph Kaye & Son Ltd. ..	Door locks and striking plate.
Dunlop Rubber Co. Ltd. ..	Dunlopillo arm-rests.
J. Stone & Co. Ltd.	Electric fans.
Sorbo Limited	Draught-excluding rubber welting around doors.
I.C.I. (Rexine) Limited.. ..	Rexine roof material.
Consolidated Brake & Engineering Co. Ltd.	Rolling ring cylinders.
Lewis Construction Co. Ltd. ..	Dovetail floor sheeting.
Westinghouse Brake & Signal Co. Ltd.	Steam cylinders.
Doulton & Co. Ltd.	Water filters.

British Freight Rolling Stock

VIII—Door-to-door service on the G.W.R.

The G.W.R. furniture container in the first illustration is representative of a type which has handled a much increased traffic in household removals during 1935. *The second container is a smaller pattern of* 2½ *tons capacity for the carriage of general merchandise. Certain loads, such as motorcars, provide their own door-to-door service by being themselves mobile, and in this case the responsibility of the railway consists in providing easy loading, stowage, and unloading facilities. These requirements are fulfilled by the wide side and end doors and roomy interior of the van in the third illustration. An additional fifty such vans were placed in service in March,* 1935, *to cater for the growing requirements of the motorcar industry. Vehicles of this type are also used for general merchandise traffic*

RAILWAY NEWS SECTION

PERSONAL

We are sorry to learn from a Press Association message that Sir Charles C. Barrie, K.B.E., M.P., a Director of the L.N.E.R., is seriously ill and has been operated upon for appendicitis at Cannes.

In our Overseas columns this week is a paragraph recording the visit of Sir Felix Pole, Chairman of Associated Electrical Industries Limited, and Mr. P. S. Turner, Chairman of the Metropolitan-Vickers Electrical Export Co. Ltd., to Brazil, in connection with the very large contract secured by the latter firm for the supply of equipment for the electrification of the Rio suburban area of the Central Railway. On the day of their arrival a luncheon party was given in order that they might meet the Director (or General Manager) of the Central Railway, and the Superintendent and engineers of the electrification works. Among those present were :—

Sir Felix J. C. Pole, Mr. P. S. Turner, Col. Mendonça Lima (Director of the Central Railway), and Drs. Djalma Maia, Rubens Toller Magno de Carvalho, Mauticio da Justa, Galvao Antunes, Ary Koerner, Rodolf Sauer, Cyrosde Carvalho, and Sr. Nestor de Carvalho, all railway engineers. Also Mr. W. A. M. Doll (Export Credits Department), Mr. Murray Harvey (Commercial Secretary to British Embassy), and Mr. H. W. Foy (Metropolitan-Vickers representative in Brazil). Also Messrs. H. C. Young, A. J. Cunningham, R. Henderson, G. H. Wion, W. H. Nealon, and R. G. Aspinall, Drs. Jose Lins, P. Lemos, J. Saldanha da Gama, Sr. D. Sabino, and Cte. A. Affonseca, Metropolitan-Vickers and sub-contractors' engineers.

Mr. F. Downes, who, as announced in our issue of December 13, will shortly retire under the age limit from the position of Signal and Telegraph Engineer, Southern Area, L.N.E.R., actually retires on February 13. He joined the Telegraph Department of the former Great Northern Railway in 1887, and three years later was transferred to headquarters at Retford as draughtsman. In 1903 he was appointed Technical Inspector, and was awarded the Rosebery medals in 1903 and 1904 for essays on railway electrification and railway signalling respectively. Promoted Assistant to the Telegraph Superintendent in 1912, Mr. Downes succeeded to the position of Telegraph Superintendent on January 1, 1913. Subsequent to the amalgamation his duties were extended to cover the whole of the Southern Area, L.N.E.R., in April, 1924, and he continued to control the technical and operating staff for telegraphy, telephony and electric signalling from Liverpool Street station as headquarters. In 1929 Mr. Downes was appointed Signal and Telegraph Engineer under the Civil Engineer, Southern Area, the position from which he now retires. He is an Associate Member of the Institution of Electrical Engineers, and Member of Council of the Institution of Railway Signal Engineers, of which he was also elected President in 1925-26. He was, moreover, President of the Signal and Telegraph Engineers (R.C.H.) Conference in 1922, was a member of the Railway Signalling Standards Committee (1922-31), and is a member of the British Standard Institution. On page 162 will be found some experiences of Mr. Downes in the course of his career.

Photo] [Lafayette

Mr. F. Downes,

Signal and Telegraph Engineer, Southern Area, L.N.E.R., 1929-35

Mr. J. H. Follows, C.V.O., C.B.E., formerly Vice-President, L.M.S.R., has been appointed Vice-Chairman of the Belper Bench. For some years past

Group taken at the luncheon of welcome to Sir Felix Pole and Mr. P. S. Turner on their arrival in Rio de Janeiro on January 10. The names of those present will be found in the paragraph above

King George V

His late Majesty conferring the honour of knighthood upon Sir Sam Fay, then General Manager of the Great Central Railway, on the occasion of the opening of The King's Dock at Immingham on July 22, 1912

King George and Queen Mary at Swindon works G.W.R., on April 28, 1924. Their Majesties are here seen in the iron foundry reading a special greeting cast in metal

Mr. Follows has been Chairman of the Juvenile Court, which office he still holds.

We regret to note the recent death of Colonel James Rawdon Stansfeld, (late R.A.), a Director of Baldwins Limited.

With regret we record the death, on January 14, of Mr. J. W. Cloud, a Director of the Westinghouse Brake & Signal Co. Ltd., who had been connected with the Westinghouse brake interests for the past 46 years, a connection that goes back to days when the late Messrs. George and H. H. Westinghouse were actively engaged in developing their brake. Mr. Cloud had a distinguished career in the United States as a motive power engineer and executive, and then returned to London in 1899 and became Vice-President of the Westinghouse Brake Co. Ltd., a position he held until 1920. From 1920 until 1931 he was the Chairman of the company—which embraced signal interests and became the Westinghouse Brake & Saxby Signal Co. Ltd. in 1921—and, from 1931, after his retirement from the chairmanship, he remained an active Director of the London company. Mr. Cloud made outstanding contributions to the development of the air brake, and was the inventor of the quick-acting triple valve for European service. He travelled widely and took a keen interest in the development of the Westinghouse brake on the Continent of Europe. He disclosed exceptional ability as an executive officer, and was universally regarded as having marked engineering talent. He was held in the highest respect, not only amongst Westinghouse companies throughout the world, but also in European railway circles.

Mr. C. W. Drusany has been appointed Manager of the Austrian State Travel Bureau, 159-161, Regent Street, London, in succession to Dr. S. Mayer, who has been transferred to the headquarters office in Vienna.

British Railway Directors' Mission to Argentina

Mr. W. Howard Williams, C.B.E., Chairman of the Central Argentine Railway, who, as recorded in THE RAILWAY GAZETTE of October 18, was sailing on November 2 for Argentina, has now concluded his visit to that country and made an important statement prior to sailing for home. The following is an extract from the report of it published in *The Buenos Aires Herald* of December 25:—

"The position of the British railways in Argentina remained the same as when he addressed the C.A.R. shareholders in London last October. Despite the passing of the crisis, Argentina was doing nothing to alleviate the black outlook for the railways, some of which were already in a state of moratorium, and others approaching it.

The situation was largely the result of exchange losses amounting to many millions of *pesos* a year, and to ever-increasing competition. Whereas the roads were exempt from almost every form of regulation or control, the railways were subject to an intense and increasing bureaucratic fiscalisation. Money could, therefore, not be spent on the upkeep of the railways which, as properties were deteriorating, as were therefore the services they provided. Modernisation of the equipment was out of the question, and it was the Argentine nation which would be the eventual sufferer.

"Having talked to many influential people of varying interests and kinds he had found a concensus of opinion that called for speedy action and remedy. He fully appreciated, and was glad to thank both the President of the Republic and the Minister of Public Works, for the special efforts they had made to get the Co-ordination of Transport Bill through Congress. Unfortunately this Bill had been shorn of its value by the Chamber of Deputies. 'It only remains for me to go back to London,' he concluded, 'and say that despite the action of the President and the recommendations of the Government's own commission, up to the present nothing has been achieved, and the position remains as it was last October."

In *The Buenos Aires Herald* of December 27, an article by "X.Ray," after suggesting that British directors had caused some temporary resentment in Argentina by their outspoken criticisms at recent general meetings, applauds this plain speaking and considers that it will eventually clear the air and make it plain that something really must be done.

He goes on, however, to express the belief that the railways are in error in continuing to consider the pound as worth $11.45 legally. That valuation has gone for ever, and there is no chance of the *peso* returning to pre-depression values. Accountancy should not, therefore, be maintained on that basis, the reiteration of which irritates Argentines and gives them ground for contending that all the figures adduced by the companies must be founded on similar error.*

On the other hand, the companies are, according to "X.Ray," fully justified in complaining of a dual value of the *peso* (a) for exporters, and (b) for importers, even if they weaken their case by adding that they are losing everything above $11.45. The whole system of Argentine railway accountancy is, he contends, archaic and urgently calls for revision.

Due to the control of the politicians by Argentine labour, the railways are prevented from effecting those essential economies so necessary in every business concern in crises when bankruptcy is the alternative. "This," he says, "is a really iniquitous state of affairs and criticism and propaganda should be concentrated thereon." He then proceeds to express the opinion that the visits of Mr. Howard Williams and his colleagues have been far from fruitless, as they have brought home to the man in the street the unfairness with which the railways are being treated.

Finally he warns Argentina that the renewal of the Roca Agreement next November will undoubtedly impose upon that country a clause ensuring the better treatment of British railway shareholders. Britain can do without Argentine meat and grain, and will please her Dominions by restricting Argentine exports in favour of theirs. This strong argument has been urged by the British railway directors, and there is little doubt that it has sunk into Argentine minds, and that for this reason the "nothing achieved" verdict upon the directors' visit is, "X.Ray" considers, erroneous.

* This aspect of the situation was dealt with in an editorial note on page 42 of our issue of January 10. —Ed. *R.G.*

Exports of Railway Material from the United Kingdom in December

	Dec., 1935	Dec., 1934	Twelve Months Ending Dec., 1935	Dec., 1934
	£	£	£	£
Locomotives, rail	188,013	113,037	876,703	453,290
Carriages and wagons	68,863	152,388	1,224,826	973,853
Rails, steel	65,659	30,371	907,362	996,044
Wheels, sleepers, fishplates and miscellaneous materials	95,208	111,599	1,840,977	1,212,042

Locomotive and rail exports included the following:—

	Locomotives		Rails	
	Dec., 1935	Dec., 1934	Dec., 1935	Dec., 1934
	£	£	£	£
Argentina	—	—	14,550	5,175
Union of South Africa	—	—	76,608	34,795
British India	5,290	47,900	26,264	52,015

The Activities of a Signal and Telegraph Engineer

With the retirement of Mr. F. Downes from the position of Signal and Telegraph Engineer, Southern Area, L.N.E.R., there closes a railway career that embraced many interesting developments on the electrical side of railway signalling, as well as telegraph, telephone and block working. A brief outline of his appointments from time to time appears with his portrait on page 159.

When he entered the service of the former Great Northern Railway in 1887, he joined the Telegraph Department, which then and for many years afterwards was the only electrical department of that system. Consequently the work it covered was very varying, and therefore abnormally interesting, and gave him first hand knowledge by association with pioneer experimental workers in connection with telegraph and lock-and-block signalling, signal repeaters, early telephones, train and general electric lighting, also track circuits, practical working examples of the latter being installed in the Gas Works tunnel, King's Cross, in 1903.

Then from 1924 onwards it fell to Mr. Downes to co-ordinate and extend communications in the Southern Area, by the establishment of through telegraph and telephone circuits linking the L.N.E.R. London termini direct with important provincial stations, thereby materially reducing retransmission of messages and effecting economy of operating staff. During 1927 and 1928 automatic telephone exchanges were inaugurated at King's Cross and Liverpool Street stations and extensive additions to the traffic control selective telephone system were made, including a master control circuit of over 300 miles, linking the Western Section control headquarters with district control offices at King's Cross, Nottingham, Sheffield, Manchester, Leeds, Doncaster and Lincoln, for either full conference or selected individual conversation, by an original method of selective calling and switching apparatus. Similar circuits followed for traffic control over the Eastern Section of the Southern Area.

As the foregoing works were installed mainly by the Telegraph Department, which also undertook all electric signalling work for the Southern Area, it became necessary to evolve a staff organisation for economic construction and maintenance. So that when, in 1929, Mr. Downes was appointed Signal and Telegraph Engineer of the area, the logical development was a further combination of staff for telegraph, electric, and mechanical signalling, including centralised workshops for this special class of work, thereby facilitating and economising activities in connection with power interlockings, colour light and automatic signalling. Important examples of the latter have been established at King's Cross and Fenchurch Street stations, Gidea Park to Shenfield, Potters Bar, Finsbury Park to Highgate, and Bethnal Green to Seven Sisters, Enfield and Clapton, together with numerous automatic block sections, remotely controlled loops, sidings and signal box amalgamations. Most of these have been described from time to time in our pages. The whole embraced over 600 miles of track circuiting, d.c. and a.c., and included the track circuits and automatic equipment for four electrically controlled hump shunting yards, for two of which switch panel and relay interlocking is embodied, a method of interlocking extended and applied for signal cabin operation to the exclusion of mechanical locking in the North Eastern Area.

Another original economic application of telephones has been installed in connection with Southern Area automatic signalling whereby a driver detained at an automatic signal can call the forward signal box selectively, ensuring private conversation until both have replaced these telephones at normal; this telephone system was described in THE RAILWAY GAZETTE of January 19, 1934.

The introduction of permanent way maintenance by motor trolley called for special means of safeguarding, which have been met in an original manner by using a " telephone token." On being released by the signalman and handed to the ganger this token authorises the latter to proceed into a block section for carrying out work, the release of such token controlling the train signalling in the normal (danger) position until the running line has been cleared and the telephone token has either been plugged into the controlling electric block circuit at an intermediate point, or returned to the signalman and utilised to restore normal train working. Installed in over 440 block sections (single and double lines) covering 1,900 miles of single track, it is devised for application to nine different forms of block apparatus obtaining in the Southern Area, thus obviating the heavy cost of changing the existing block apparatus to accommodate a type of safeguard previously applicable only to electric token block signalling on single lines of railway.

The advent of the electric power point machine, together with the air-depolariser leclanché type of primary cell, rendered economically possible the working of points and signals at considerable distances from signal cabins even in outlying places where a power supply was not available. In the numerous amalgamation works where signal cabins have been closed, many cases occur where an output up to about 7 amps. at 30 volts for 3 to 4 seconds is required, and is beyond the reliable capacity of the air-depolarised battery when operation of points occur in quick succession. In the Southern Area such cases are economically and satisfactorily met by charging secondary cells from the primary battery, there being ample rest periods during which a restricted charge within the capacity of the latter can be set.

Many other instances obtain where originality in devising special equipment for practical application of scientific methods for railway work, has been shown by the very competent combined technical staff in the Southern Area.

Until recent years mechanical signalling activities on the L.N.E.R. were vested with the District Engineers, and the co-ordination of all such work under the control and supervision of the Signal and Telegraph Engineer was an entirely new development. Mr. Downes, early realising the necessity for educating the combined working staffs for dual duties of installation and maintenance, readily obtained financial and other facilities for the inauguration of instruction classes. These created a keen interest, but lacked practical demonstration, which for economic and convenient reasons could be provided only by mobile equipment to meet the demand of the extensive Southern Area.

Headquarters support was again readily accorded, authority being given for a large brake van to be equipped with a model railway layout complete with track circuiting, and locking frames, together with actual sized apparatus, by means of which the principles and foundations of applied signalling can be demonstrated and the cure and prevention of faults explained. The van—which was described in our issues of January 5 and February 9, 1934—was constructed and equipped by the company's technical and workshops staff and has been of great service. Requests are being considered to extend classes in conjunction with educational authorities who find an increasing public interest in such railway activities.

BEARDMORE'S LONDON OFFICE.—The London address of William Beardmore & Co. Ltd. is now 3, St. James's Square, S.W.1. Telephone, Whitehall 6844; telegrams, Beardmore, Piccy, London.

COLLISION NEAR LOUGHBOROUGH, L.M.S.R.—At 3.42 a.m. on Tuesday, January 21, the 10.30 p.m. freight train from Peterborough to Derby collided with the rear of the 3 a.m. empty wagon train from Brent to Toton, which had broken loose. The accident occurred between Sileby and Barrow-on-Soar, near Loughborough. The guard of the latter train was killed and all four lines were blocked. An up train which was approaching at the time ran into the wreckage.

The Structure and Organisation of the Reichsbahn

(*See diagrams on pages* 164 *and* 165)

Since the transfer of the former individual State railways of Germany to the Reich or central State authority nearly 16 years ago, there has been a complete reorganisation, the nature of which cannot be fully appreciated without some reference to the successive stages of its development. Such an historical survey forms part of a paper by Reichsbahndirektor Dr. Kittel in a special centenary issue of *Die Reichsbahn* from which one of the accompany charts is reproduced showing the present day constitution and organisation of the German State Railway.

With the exception of the few private railways still existing in Germany, all the railways had passed into the hands of the individual States by the beginning of the present century. Practically the whole of the network was made up of seven State railways, by far the largest of which was the Prussian State Railway, including the administration of the Hessian railways. At that time the internal affairs of Germany were largely under the jurisdiction of the individual States and the railways constituted an important factor in their budgets. As long as the extension of the railways was a leading consideration in railway policy, the financing of this work was necessarily related closely to the general financial policy of the States. On the other hand, as the network approached completion, the problems were more and more restricted to those of efficient operation and utilisation of the system as a whole. This consideration and the increasing effects of representative government led to a certain measure of separation between railway and State economics before the war.

In 1923 the Deutsche Reichsbahn (German State Railway) was constituted as an organisation with full legal and economic independence of parliamentary majority and similar influences. This organisation might have endured to the present time, as in the Reichspost (German Post Office), but a change was required in the autumn of 1924 in order that the railways might collect 660 million gold marks per annum for reparations under the Dawes Plan. The imposition of the title Deutsche Reichsbahn Gesellschaft (German State Railway Company) by the German Railway Act of 1924 was misleading, the concern actually remaining a public corporation.

With the cessation of reparations payments and the elimination of foreign co-administrators in 1930, the State Railway again became purely German in its organisation and purpose. The vigorous policy of the present Government is fully operative by direct personal relations and through the supervisory board, the dual control being exercised as shown by the diagram on page 164, Fig. 1.

The present internal organisation of the German State Railway is not the outcome of any prolonged period of evolution. The seven independent State railway networks were combined in 1920 at a time of great economic difficulty and when the technical equipment of the railways was still greatly deranged and depreciated by the effects of the war. For a time, the combination amounted to little more than centralised direction by the newly formed Ministry of Transport, but unified management, financial and traffic policy, and standardised operation were gradually introduced. Technical standardisation of locomotives, vehicles and other equipment has proceeded at a rate determined by the need for replacements and the available economic resources.

The present organisation of the German State Railway under the General Manager and Main Administration, as shown diagrammatically in Figs. 2 and 3, has been evolved since 1920 by successive changes, all directed towards increased efficiency of service and economy of operation. Two diagrams are taken from an informative lecture delivered by Dr. Domsch at the 5th Training and Educational Conference of the German State Railway, and published in a booklet which was reviewed in our issue for December 12, 1934. Fig. 2 shows the general organisation of the various head offices and departments on the German State Railway, and Fig. 3 shows the structure of one of the divisions (Reichsbahndirektionen) the example taken being the Dresden Division. In addition, the interconnection of the commercial service properly so called, *i.e.* the service which is concerned with traffic and the getting of traffic, as distinct from the actual working of the trains, is specially indicated on the diagrams.

It is a little difficult to give exact translations in some cases, as the organisation differs in certain respects from that adopted in Great Britain and elsewhere, with the result that some of the departmental titles customarily employed here do not quite convey what is intended. The different system of education for and promotion in the State railway service in Germany leads to the titles of the various officers not corresponding exactly, in numerous instances, with the ranks obtaining on the privately owned British railway systems.

London East Divisional Engineer's Staff Dinner, S.R.

On Friday, January 17, Mr. F. E. Campion, Divisional Engineer, London East Division, Southern Railway, presided over a dinner at which about 160 members of his staff and guests were present. Among those present were:—Messrs. D. R. Bennett, H. E. Bromley, H. I. Bond, J. C. Butler, A. Curtis, A. B. Chester, J. T. Cloke, L. Furnival, E. Greenhalgh, H. Janes, F. Lowe, C. A. G. Linton, C. J. C. Latham, T. Pease, H. E. Robarts, J. Symes, D. Sheppy, J. E. Taylor, C. F. Tofts, A. White and W. A. Willox. In proposing the toast of "The Chairman," Mr. A. B. Chester, Assistant Divisional Engineer, expressed the thanks of the staff for the genial and impartial presidency of their chief during his first year of office. Mr. Campion was one for whom everyone always did his best and whose happy dealing with all those under him inspired confidence and loyalty.

Mr. F. E. Campion, after reading a message of good wishes from the Chief Engineer, who was unavoidably prevented from attending, thanked both the outdoor and indoor staff for the good work they had done in the year just passed, and especially for their ready and valued assistance to him in his first year of office. He spoke of the interlocking functions of the various sections of the division, all of which co-operated so well together and with so little friction. It was this happy state of affairs that enabled the division not merely to cope with day-to-day tasks, but equally to meet the various emergencies that inevitably arose from time to time. Mr. Campion also spoke appreciatively of the assistance he had received from the other departments of the railway with which the engineers came in contact, and, without reviewing the work which had been accomplished during the year, gave the impression of a big task successfully carried through, not so much due to any one person's merits, as to the way all had pulled together.

Mr. J. T. Cloke, Chief Clerk, proposed the toast of "The Visitors," mentioning several by name, and particularly Mr. Linton, their late chief, whom it was strange though pleasant to welcome as a guest.

Mr. C. A. G. Linton, Assistant Engineer (General Maintenance), responding, told of the great help he had received from the division during his first year at headquarters, a year in which a very heavy programme of work had been carried out. If, as he had every reason to expect, the same willing assistance was forthcoming during the next year, there should be no difficulty in carrying out a programme which involved a more difficult task than had been undertaken for many years. There was, for instance, a greater variety of materials and more of them required for permanent way renewal this year than ever before, and the correct and punctual distribution of these materials would call for a considerable effort which he felt sure would be readily forthcoming. Mr. A. White, Divisional Superintendent, London (East), also replied with appreciative remarks on the friendly relations between the traffic and the engineer's departments on the Southern.

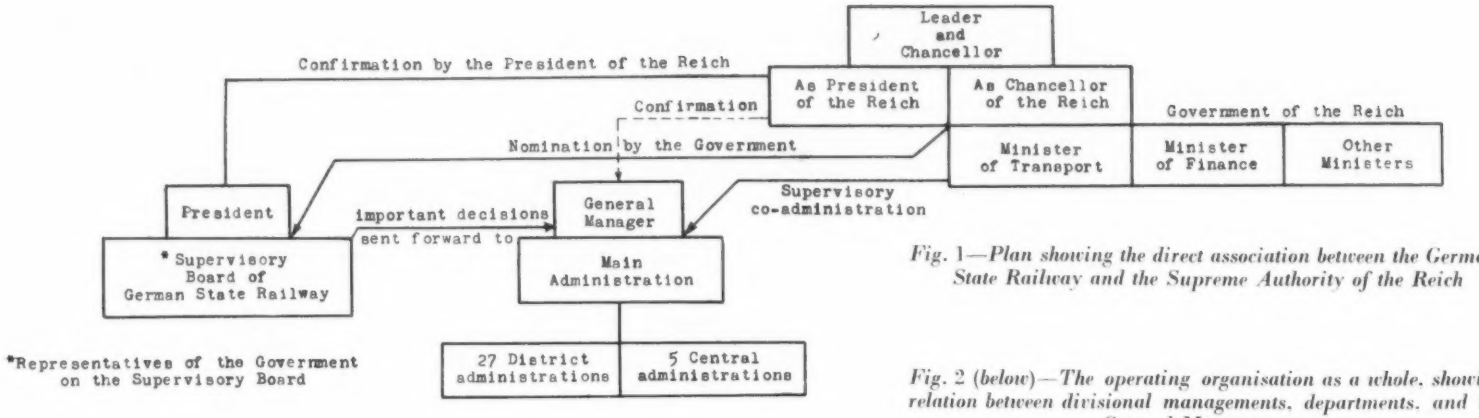
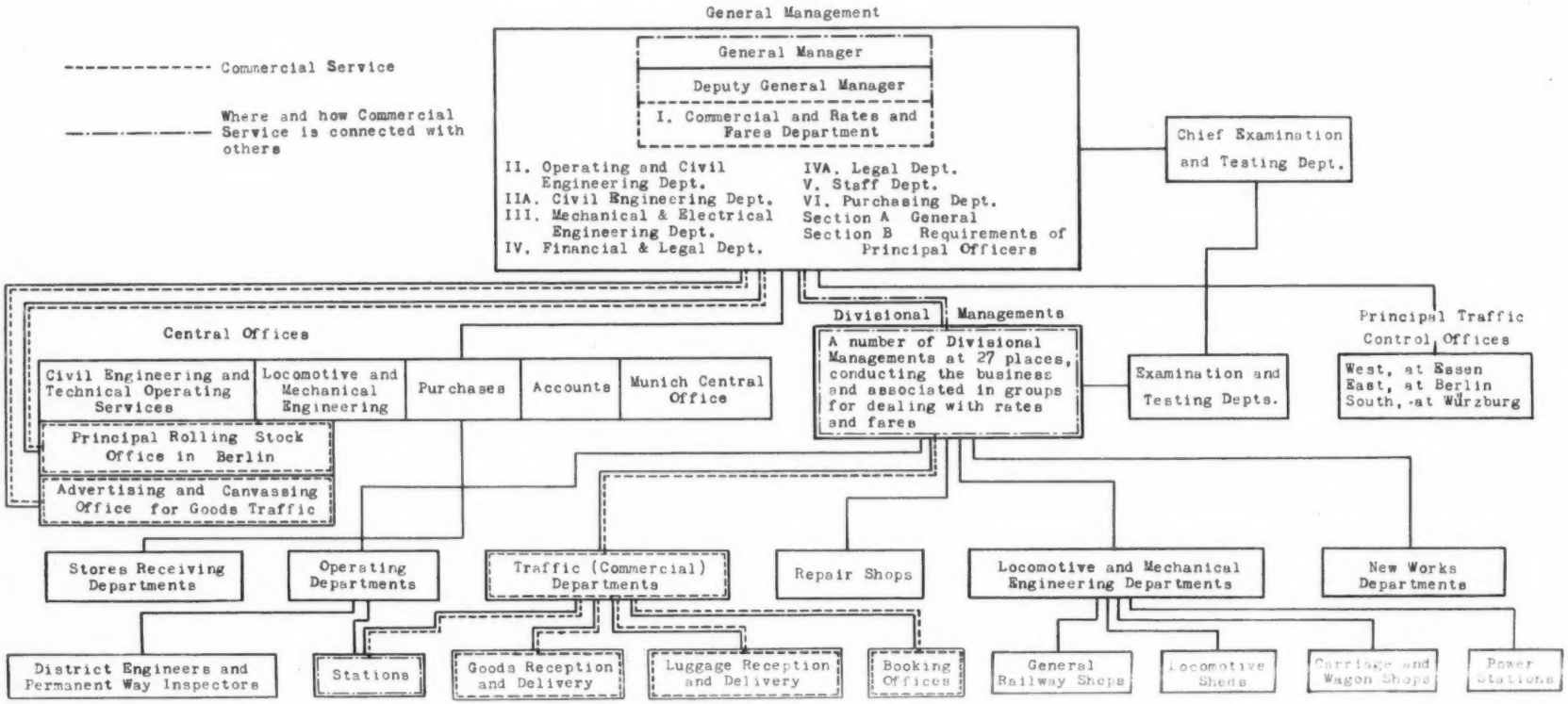


Fig. 1—Plan showing the direct association between the German State Railway and the Supreme Authority of the Reich

Fig. 2 (below)—The operating organisation as a whole, showing relation between divisional managements, departments, and the General Management


General Management
Commercial Service
Where and how Commercial Service is connected with others
General Manager
Deputy General Manager
I. Commercial and Rates and Fares Department
II. Operating and Civil Engineering Dept.
IIA. Civil Engineering Dept.
III. Mechanical & Electrical Engineering Dept.
IV. Financial & Legal Dept.
IVA. Legal Dept.
V. Staff Dept.
VI. Purchasing Dept.
Section A General
Section B Requirements of Principal Officers
Chief Examination and Testing Dept.
Central Offices
Civil Engineering and Technical Operating Services
Locomotive and Mechanical Engineering
Purchases
Accounts
Munich Central Office
Principal Rolling Stock Office in Berlin
Advertising and Canvassing Office for Goods Traffic
Divisional Managements
A number of Divisional Managements at 27 places, conducting the business and associated in groups for dealing with rates and fares
Examination and Testing Depts.
Principal Traffic Control Offices
West, at Essen
East, at Berlin
South, at Würzburg
Stores Receiving Departments
Operating Departments
Traffic (Commercial) Departments
Repair Shops
Locomotive and Mechanical Engineering Departments
New Works Departments
District Engineers and Permanent Way Inspectors
Stations
Goods Reception and Delivery
Luggage Reception and Delivery
Booking Offices
General Railway Shops
Locomotive Sheds
Carriage and Wagon Shops
Power Stations

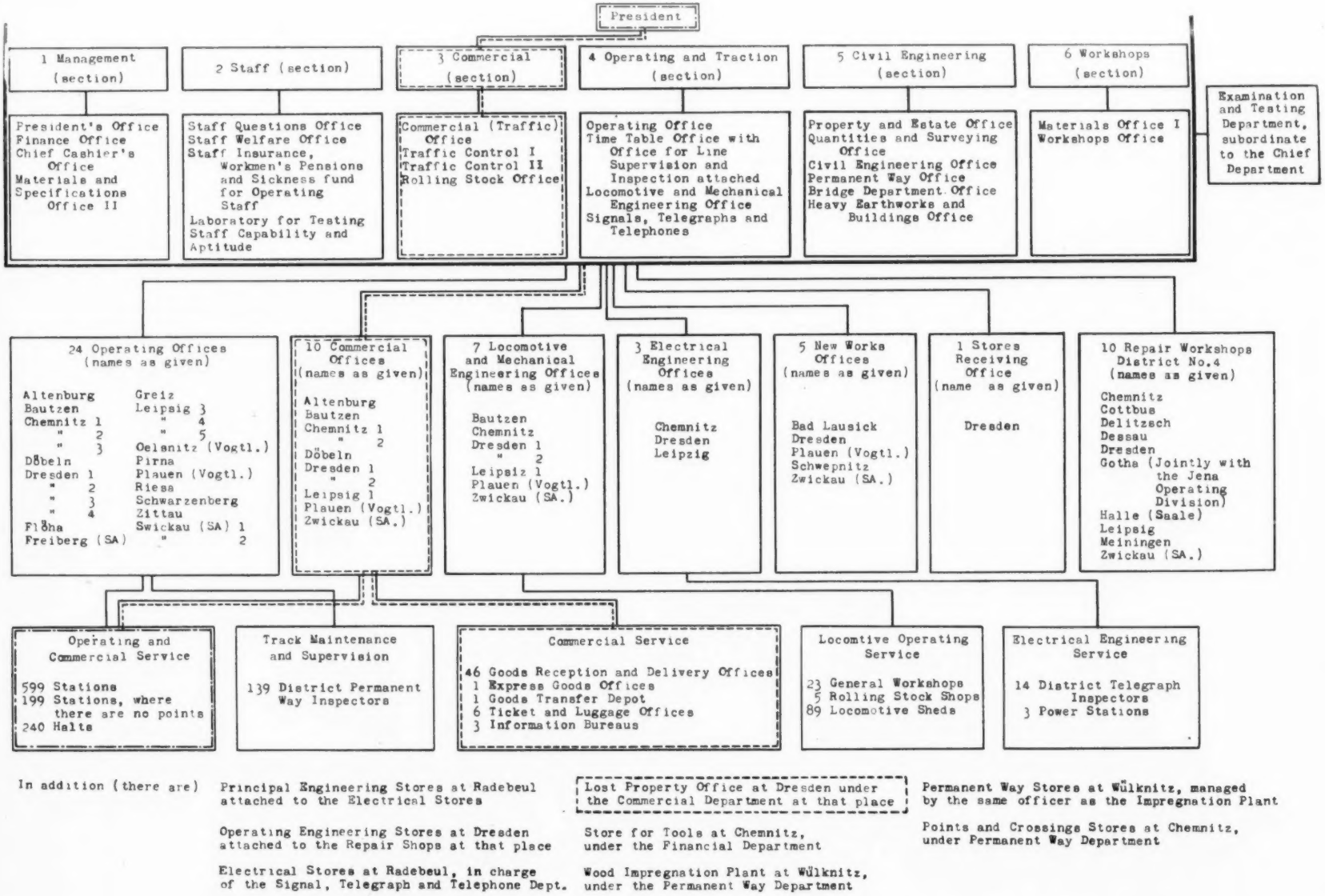


Fig. 3—Interior organisation of a divisional management of the German State Railway

Save to Travel

(See editorial note on page 134)

"Save to Travel" is the new slogan created by the L.M.S.R. and the L.N.E.R. to popularise a recently-introduced system of saving for holiday travel, generally similar to that used in connection with the sale of National Savings Certificates. This follows the success of a comparable scheme initiated last spring by the G.W.R., a description of which was given on page 535 of THE RAILWAY GAZETTE for March 15, 1935.

Special collecting cards are provided on which are left blank spaces to be filled by ten one-shilling stamps of special design, obtainable from any L.N.E.R. or L.M.S.R. booking office. When a collecting card has its complement of stamps it may be exchanged for a ten shilling voucher. This voucher, which bears interest at the rate of one halfpenny a month for one year, may then be used to purchase any railway ticket of not less than half-a-crown in value, except a season. Thus, a ten shilling voucher, eight months after issue, may be used to buy, for example, one ticket of 10s. 4d., or four tickets of 2s. 7d.

Together with each collecting card there is issued a neat stiff paper wallet —green for the L.N.E.R., and red for the L.M.S.R.—in which there are separate pockets for vouchers and collecting cards. Only in the case of the L.M.S.R. does the issuing of a card or the sale of stamps involve any recording by the booking clerk concerned.

The essential difference between the G.W.R. and the L.M.S.R. and L.N.E.R. schemes is the allowance by the two latter companies of interest on every complete ten shillings deposited. Moreover, in the case of the G.W.R. scheme, a collecting card's complement of stamps consists of 20 ordinary sixpenny postage stamps.

E.R.O. 42526.
LPNRS. 4/8.

No. A 00207

Date of issue

Issued to

E.R.O. 42526.
LPNRS. 4/8.

No. A 00207

PASSENGER "SAVE TO TRAVEL" VOUCHER.

The London Midland & Scottish Railway Company acknowledges the receipt of "Save to Travel" Stamps to the value of **TEN SHILLINGS**, and undertakes to issue, within the next twelve months, a ticket or tickets in exchange to that amount, plus interest.

Signed

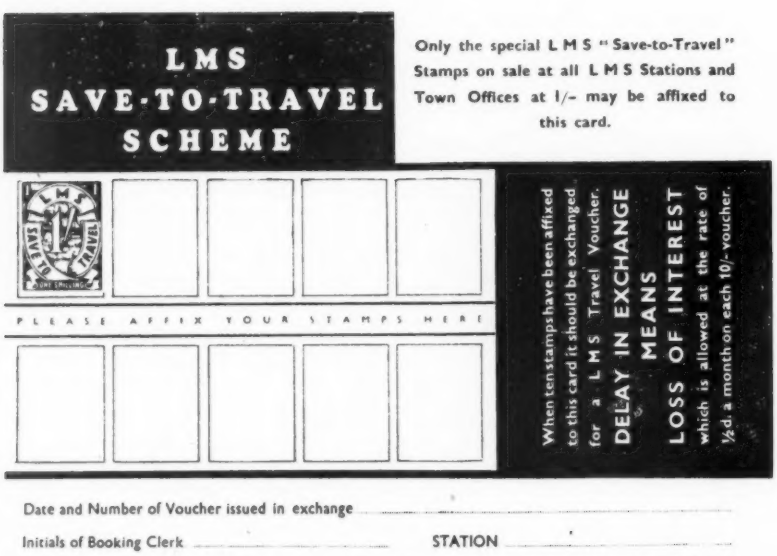
Station

Date

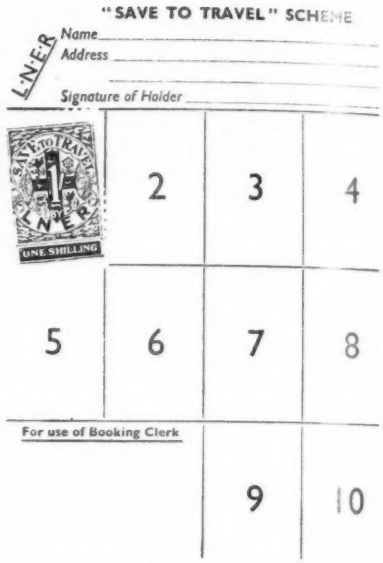
Signature of Holder

Address

A specimen L.M.S.R. ten shilling voucher


LMS
SAVE-TO-TRAVEL
SCHEME
Only the special L M S "Save-to-Travel" Stamps on sale at all L M S Stations and Town Offices at 1/- may be affixed to this card.
PLEASE AFFIX YOUR STAMPS HERE
When ten stamps have been affixed to this card it should be exchanged for a L M S Travel Voucher.
DELAY IN EXCHANGE MEANS LOSS OF INTEREST
which is allowed at the rate of ½d. a month on each 10/- voucher.
Date and Number of Voucher issued in exchange
Initials of Booking Clerk
STATION
PLEASE KEEP THIS CARD IN THE SPECIAL WALLET

An L.M.S.R. collecting card and stamp. Both are printed in red



An L.N.E.R. collecting card and stamp. Both are printed in green

TWO M. OF T. ACCIDENT INQUIRIES.—The derailment of the down Stranraer boat train, in the early morning of Monday, December 30, just as it was leaving the Ken viaduct, about half-a-mile on the Stranraer side of Parton station, L.M.S.R., was inquired into on Tuesday, January 7, by Colonel Trench. No light was thrown on the cause of the accident. There was a speed restriction of 45 m.p.h. over the viaduct, but apparently the train was running at 25 to 30 m.p.h. The only irregularity revealed was that the driver of the assistant engine left the working of the continuous brake in the hands of the driver of the train engine.

The collision on January 1 at the east end of Victoria station, Manchester, when a freight train got out of control as it was descending the Miles Platting Incline, was inquired into by Major G. R. S. Wilson on Wednesday, January 8. The train consisted of 42 loaded wagons and a brake van and, in accordance with the rules, should have stopped at the top of the incline for the breaks of six wagons to be pinned down by the guard and six by the fireman. It did not stop, and the evidence showed that that was an almost regular occurrence except for a very heavy train. When the signalman in Victoria East Junction saw that the train was out of control he had quickly to decide into which of two platform roads he should turn the train. He selected the one in which the standing passenger train was more lightly loaded and to which the locomotive was not attached; it gave a longer length, also, for the train to pull up in after the impending collision. For this action he was commended by Major Wilson.

RAILWAY AND OTHER MEETINGS

Rohilkund & Kumaon Railway Co. Ltd.

The ordinary general meeting of the Rohilkund & Kumaon Railway Co. Ltd. was held at the company's offices, 237 Gresham Place, Old Broad Street, E.C.2 on January 21, the Chairman, Sir Henry P. Burt, K.C.I.E., C.B.E., presiding.

The Secretary, Lt.-Col. W. R. Izat, D.S.O., R.E., read the notice convening the meeting and the auditors' report.

The Chairman at the commencement of the business said: "We are meeting under the shadow of an overwhelming sorrow. I would ask you to stand in silence for a minute as a mark of love and affection for our beloved Sovereign."

The shareholders stood in silence.

Moving the adoption of the report and accounts, the Chairman said that certain changes had taken place in the constitution of the board since their last meeting. Lt.-Col. W. R. Izat, D.S.O., R.E., having resigned his position as a director, had been appointed by the board to be the Secretary of the company, and to fill the vacancy on the board caused thereby, Lt.-Col. T. Gracey, R.E., now Chairman of their neighbouring line the Bengal & North Western Railway, had been appointed to be a director. He was not present at their meeting as he has been deputed by the board to visit India in connection with the company's business.

It was satisfactory to note that the general results of the working of the joint undertaking for the year ended September, 1935, were again satisfactory, the gross earnings being Rs. 68·54 lakhs, which was practically the same as the preceding year and exceeded those for any of the previous five years.

There had been a slight falling off in the company's coaching traffic both in numbers and receipts compared with the preceding year; 39,532 fewer passengers having been carried, and the earnings being Rs. 10,860 less. The numbers and receipts, however, exceeded those for any of the five years prior to 1934. As regards motorbus competition, there had been no new developments to record during the year, and the measures which had been taken to meet the situation continue to be effectual.

It was only in the neighbourhood of large towns that road competition undoubtedly affected the company's short distance traffic, and speaking generally, the road motors had not so far had any serious effect on earnings.

In his speech last year he had referred to the fact that measures were being considered which would place the railways and road transport on a more equitable basis than existed at present. A Transport Advisory Council had now been formed by the Government of India to secure the co-ordinated development of road and rail transport, and each local government had been asked to create or maintain provincial boards of communications with advisory functions on which railways of the province would be adequately represented.

It was hoped that each local government would take measures to establish machinery for the control of motor transport according to the circumstances of each province, and that these measures would be adequate to carry out the detailed recommendations of the Transport Advisory Council, and so overcome to some extent the conflict between the interests of the Central Government which controlled the railways, and the local governments which control the roads.

Goods traffic showed an increase in the tonnage carried, but the receipts therefrom were practically the same as last year. There was a heavy decrease in the carriage of sugar cane, as this suffered from frost and insect pests, and as a consequence the crop was reduced and the working season curtailed. The fluctuations in goods traffic under the other commodities did not call for any special notice, as the decreases under gur, jagree and molasses were consequent upon the falling off in the cane crop.

The percentage of working expenses to gross earnings was 45·93, slightly more than the low percentage of 45·51 worked to in the preceding year, a result which might be considered very satisfactory.

The company's share of the net earnings of the Joint Undertaking, as shown in the net revenue account, amounted to £127,073, to which must be added the surplus profits of the Lucknow Bareilly State Railway (£9,003) and gain by exchange (£716), making a total of £136,792 against £141,256 for the previous year or a decrease of £4,464.

After making the necessary adjustments on account of debenture interest, and preference and interim dividends, and providing £7,400 for the Secretary of State's share of surplus profits, the amount to be dealt with was £58,964. Out of that sum the directors proposed to pay a final dividend of 6 per cent., with a bonus of 4 per cent., amounting to £35,167. This, together with the interim dividend and bonus of 6 per cent. already paid, would make a total distribution of 16 per cent. for the year. The carry forward to next year would then be increased to £23,798.

At the meeting in 1935 he had explained the steps which the board had taken to safeguard the interests of its shareholders under the new Constitution for India. As they were aware, the Government of India Act had now been passed by both Houses of Parliament and had become law, and the safeguards considered necessary to protect their interests have been embodied in the Act. He did not think, therefore, that they need have any anxiety that the provisions of the company's contracts with the Secretary of State would not be respected to the full.

In 1928 the late Dr. Sladen was appointed to consider the steps which should be taken to improve the medical arrangements on the railway, and following on the recommendations submitted by him, a properly equipped hospital had now been built at Izatnagar at a cost of about Rs. 82,000. This was opened during the year under review.

According to the latest advice received from the company's Agent in India, the prospects for the current year were not unsatisfactory.

In conclusion the Chairman wished to record the company's appreciation of the way in which its staff of all ranks, both in India and in its London office, had discharged their duties.

The motion by the chairman: "that the report of the directors, dated January 11, 1936, together with the audited statements of accounts and balance sheets for the year ended September 30, 1935 be, and they are hereby received, approved and adopted," was seconded by Sir Leonard L. Cohen, K.C.V.O., and was unanimously carried.

The Chairman then moved a second resolution, as follows: "that the final dividend of £6 per cent. and a bonus of £4 per cent. for the half-year ended September, 1935, on the ordinary stock of the company, subject to income tax, be, and the same is hereby declared, making with the ad-interim dividend of £4 per cent. and a bonus of £2 per cent. paid on July 29, 1935, a total dividend of £16 per cent. for the year ended September 30, 1935."

The Rt. Hon. Lord Meston, K.C.S.I., seconded, and the resolution was carried unanimously.

The Chairman: "I have now very much pleasure in moving that Lt.-Col. T. Gracey, R.E., be, and he is hereby re-elected a director of the company."

Mr. W. Stantiall seconded, and the resolution was carried unanimously.

The Chairman: "I also have very much pleasure in moving, that Mr. W. Stantiall, C.I.E., be, and he is hereby re-elected a director of the company."

Sir Leonard L. Cohen, K.C.V.O., seconded, and the resolution was carried unanimously.

The re-election of the auditors, Gerard Van de Linde and Son, and Sissons, Bersey, Gain, Vincent and Company, at a remuneration, respectively, of 45 guineas per annum, was moved by Mr. J. H. F. Reed, seconded by Lt.-Col. W. R. Izat, and carried unanimously.

Mr. J. H. F. Reed also moved a vote of thanks to the Chairman and directors, also to the Agent and the staff in India and England for their services during the past year. This was seconded by Lt.-Col. W. R. Izat and carried unanimously.

NOTES AND NEWS

Permanent Way Institution Functions Postponed.—The Permanent Way Institution announces that, owing to the death of His Late Majesty King George V, the annual general meeting and winter dinner, arranged to take place on Saturday, January 25, will be postponed.

Institute of Transport Fixture Postponements.—As a result of the death of King George V, who was the Patron of the institute, the dinner which was due to be held on February 21 will be cancelled or postponed. The joint meeting of the institute with the Société des Ingénieurs Civils de France, which was to have taken place on Tuesday next, January 28, for the discussion of a paper on "Mechanical Traction on the French Waterways," by Monsieur L. P. Alvin, has also been postponed.

Canadian Pacific Earnings.—Gross earnings of the Canadian Pacific Railway for the month of November, 1935, amounted to $11,859,000, an increase of $675,000 in comparison with November, 1934. In the working expenses of $8,404,000 there was an increase of $661,000, leaving net earnings $14,000 higher, at $3,455,000. For the 11 months to November 30, 1935, gross earnings were $118,098,000, an increase of $3,261,000, and net earnings $19,091,000, a decrease of $2,122,000.

Canadian National Earnings.—For the month of November, 1935, gross earnings of the Canadian National Railways amounted to $15,253,708, an increase of $1,471,688 in comparison with November, 1934. Operating expenses ($12,918,551) advanced by $836,544, leaving net earnings $635,144 higher, at $2,335,157. Aggregate gross earnings from January 1 to November 30, 1935, were $158,209,796, an improvement of $6,661,775, and the aggregate net earnings of $12,130,956 showed an increase of $479,009.

Death of Royal Train Locomotive Inspector.—We learn with regret of the sudden death, on January 22, of Mr. F. C. Sheldon, Senior Locomotive Running Inspector, G.W.R., whose award of the M.B.E. in the New Year Honours List we recorded in our issue of January 3. He was 63 years of age and had a notable career on the footplate as express driver and inspector. His name is well known to all who have followed the remarkable course of Great Western locomotive performance during the past decade.

Leopoldina Railway Tariffs.—The Leopoldina Railway Company announces that, following the representations made to the Brazilian Government, authorisation has been received from the Minister of Transport for certain increases to be put into force in passenger (including suburban) fares, and in parcels and goods tariffs, on the Federal lines, and in passenger fares on the Minas lines. It is expected that the approval of an increase in goods tariffs on the company's lines in the State of Minas and of all its tariffs on the railways in the State of Rio will shortly be given.

Home Railway Dividend Dates.—The respective dates on which the four group railway companies are expected to announce their final dividends are :—February 10, Southern ; February 12, Great Western and London Midland & Scottish ; February 21, London & North Eastern.

Collision at Edinburgh, L.N.E.R.—Nineteen persons were injured as the result of a collision between two trains outside Waverley station, Edinburgh, on Monday, January 20. When about to enter No. 2 platform a North Berwick train collided with a stationary light engine near the east-end signal box.

Cambridge L.N.E.R. Lecture and Debating Society.—The Cambridge L.N.E.R. Lecture and Debating Society, which was formed at the beginning of this year, held its opening meeting on January 15, when the President, Mr. H. F. Sanderson (District Superintendent, Cambridge) gave a lantern lecture on "The Whitemoor New Marshalling Yards." Sir Ralph Wedgwood, Chief General Manager, L.N.E.R., has accepted the position of Honorary President of the society.

American Railway Safety in 1935.—No passenger was killed in an accident to a train on the American railways during 1935, a record believed to have been achieved for the first time in American railway history. Mr. H. G. Taylor, Chairman of the Western Association of Railway Executives, who made the foregoing announcement, contrasted it with the fact that 36,400 people are estimated by the National Safety Council to have died on the roads during the same period. Motor-car-train accidents at level crossings are still high (1,554 killed and 4,300 injured in 1934), but are showing a declining tendency.

Bridging San Francisco Bay.—The San Francisco-Oakland Bay and Golden Gate bridges at San Francisco, which were described in THE RAILWAY GAZETTE of May 25, 1934, are both expected to be completed early in 1937. The east crossing of the former, from Yerba Buena island to Oakland, is in an advanced stage, five 509-ft. truss spans and 14 of 291 ft., leading up to the main 1,400-ft. cantilever span, being already finished. The cantilever span itself is now partially complete. The bridge will carry 6 lines of private motor traffic, 3 lines of heavy lorries, and a double tramway track between San Francisco and Oakland. The two 746-ft. towers of the bridge across the Golden Gate have now been raised, and the catwalk cables for the 4,200-ft. main span slung between them. This bridge will carry 6 lines of vehicular traffic, with accommodation for foot passengers at each side.

New Locomotives and Coaches, L.N.E.R.—Under the Government Guaranteed Loan, the L.N.E.R. is to build 22 new locomotives at Doncaster and will also add 225 coaching vehicles, to be built mainly by outside contractors, to its passenger stock. Details are given in our Contracts and Tenders page this week.

High-Speed Steam Push-and-Pull Train in Germany.—The Lübeck-Büchen Railway Company has recently acquired a streamlined 2-4-2 tank engine intended for fast service between Lübeck and Hamburg. The locomotive is designed for a maximum speed of 75 m.p.h. and can be driven from a control compartment at the far end of the second of two double-deck cars now under construction.

Fatal Accident to a Ballast Train, L.N.E.R.—On the morning of Sunday, January 19, a ballast train was proceeding to do work at Barnby and had to call at Barkston to pick up more men. While so doing the train was run into by two light engines coupled together. These came into collision with a brake van at the rear of the ballast van and eight of its occupants lost their lives. The inquest was held on Tuesday last and adjourned until February 17.

Colour-Light Signals for L.M.S.R. London Line.—Multiple-aspect type colour-light signals are to be installed by the L.M.S.R. between Carlton Road junction (Kentish Town) and Finchley Road (West Hampstead) on the main line from St. Pancras. These will replace ordinary semaphore signals, and their introduction, coupled with certain alterations in placing, will improve traffic working over this section of line, which is entirely in cutting or in tunnels, including the 1,822-yd. Belsize tunnel.

The Shrivenham Fatal Accident.—Colonel Mount took the Ministry of Transport inquiry into the fatal collision of January 15 at Shrivenham on Tuesday last, where, among the officers present, were Messrs. H. L. Wilkinson, C. B. Collett, P. W. Pine (Legal Department), A. S. Quartermaine, F. C. Hall (Loco. Running Supt.) and H. F. D. Page. Mr. Wilkinson stated that the collision was primarily caused by the failure of the drawbar hook of a privately-owned wagon on a freight train that caused the last five wagons and the brake van to become detached and the mail train was then allowed to enter the occupied section. Mr. Collett said that a third-class coach next to the engine and a brake van, carrying parcels, were badly damaged, and the third vehicle, a first-class sleeping car, slightly so. The body of the leading coach was detached from the steel underframe, and it rolled down the

bank. An extraordinary feature was that five doors on one side of that vehicle and four on the other could be opened freely by the rescue party. All the vehicles had steel underframes and wooden bodies encased in steel; the latter was intended as a precaution against fire and not against telescoping or other such ill-effects of a collision. There was no telescoping in this case. The small casualty list was entirely attributable to that form of construction which prevented any concertina action and the crushing of the passengers. The wider buffers were very effective, the defect in the coupling was in the Gedge slot in the drawbar hook and could not be observed under normal inspection. The evidence as to the working of the train was given in camera.

A Continental Test Train.—The Northern Railway of France has recently tried between Paris and Douai a special train composed of two German, two Belgian and two French main line carriages as used in express trains, in order to test their relative stability. The total weight of the coaches was 280 tons, and the train was hauled by a Pacific-type locomotive. At sustained speeds of 150 km.p.h. (93 m.p.h.) and a maximum speed of 162 km.p.h. (100·7 m.p.h.) the running of the French coaches is reported to have given perfect stability. It is understood that this same test train has been running on various Continental railways.

Road Accidents.—The Ministry of Transport return for the week ended January 18 of persons killed or injured in road accidents is as follows. The figures in brackets are those for the corresponding period of last year:—

	Killed, including deaths resulting from previous accidents		Injured	
England ...	81	(102)	2,530	(2,848)
Wales	2	(6)	95	(98)
Scotland ...	17	(7)	264	(277)
	100	(115)	2,889	(3,223)

The total fatalities for the previous week were 112, as compared with 137 for the corresponding period of last year.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 3rd Week			Totals to Date		
	1936	1935	Inc. or Dec.	1936	1935	Inc. or Dec.
L.M.S.R. (6,923 mls.)	£	£	£	£	£	£
Passenger-train traffic...	359,000	363,000	– 4,000	1,091,000	1,082,000	+ 9,000
Merchandise, &c. ...	450,000	442,000	+ 8,000	1,283,000	1,245,000	+ 38,000
Coal and coke ...	293,000	278,000	+ 15,000	857,000	778,000	+ 79,000
Goods-train traffic ...	743,000	720,000	+ 23,000	2,140,000	2,023,000	+ 117,000
Total receipts	1,102,000	1,083,000	+ 19,000	3,231,000	3,105,000	+ 126,000
L.N.E.R. (6,336 mls.)						
Passenger-train traffic...	239,000	237,000	+ 2,000	750,000	733,000	+ 17,000
Merchandise, &c. ...	327,000	315,000	+ 12,000	926,000	895,000	+ 31,000
Coal and coke ...	282,000	260,000	+ 22,000	769,000	715,000	+ 54,000
Goods-train traffic ...	609,000	575,000	+ 34,000	1,695,000	1,610,000	+ 85,000
Total receipts	848,000	812,000	+ 36,000	2,445,000	2,343,000	+ 102,000
G.W.R. (3,750¼ mls.)						
Passenger-train traffic...	161,000	167,000	– 6,000	480,000	482,000	– 2,000
Merchandise, &c. ...	178,000	177,000	+ 1,000	513,000	516,000	– 3,000
Coal and coke ...	125,000	113,000	+ 12,000	361,000	326,000	+ 35,000
Goods-train traffic ...	303,000	290,000	+ 13,000	874,000	842,000	+ 32,000
Total receipts	464,000	457,000	+ 7,000	1,354,000	1,324,000	+ 30,000
S.R. (2,154 mls.)						
Passenger-train traffic...	239,000	242,000	– 3,000	724,000	718,000	+ 6,000
Merchandise, &c. ...	55,000	56,500	– 1,500	157,500	163,000	– 5,500
Coal and coke ...	41,000	37,500	+ 3,500	111,500	100,000	+ 11,500
Goods-train traffic ...	96,000	94,000	+ 2,000	269,000	263,000	+ 6,000
Total receipts	335,000	336,000	– 1,000	993,000	981,000	+ 12,000
Liverpool Overhead ... (6½ mls.)	1,175	1,090	+ 85	3,623	3,310	+ 313
Mersey (4½ mls.) ...	4,422	4,314	+ 108	13,551	13,145	+ 406
*London Passenger Transport Board ...	532,200	529,800	+ 2,400	15,790,800	15,550,200	+ 240,600
IRELAND						
Belfast & C.D. pass. (80 mls.)	1,959	2,038	– 79	5,281	5,448	– 167
,, ,, goods	483	474	+ 9	1,121	1,114	+ 7
,, ,, total	2,442	2,512	– 70	6,402	6,562	– 160
†Great Northern pass. (543 mls.)	7,650	7,350	+ 300	15,850	15,100	+ 750
,, ,, goods	10,350	10,000	+ 350	19,550	18,550	+ 1,000
,, ,, total	18,000	17,350	+ 650	35,400	33,650	+ 1,750
†Great Southern pass. (2,076 mls.)	18,483	17,957	+ 526	37,317	36,505	+ 812
,, ,, goods	39,034	43,860	– 4,826	77,290	84,548	– 7,258
,, ,, total	57,517	61,817	– 4,300	114,607	121,053	– 6,446

* 29th week, the receipts for which include those undertakings not absorbed by the L.P.T.B. in the corresponding period last year; last year's figures are, however, adjusted for comparative purposes
† 2nd week

British and Irish Railways Stocks and Shares

Stocks	Highest 1935	Lowest 1935	Prices Jan. 22, 1936	Prices Rise/Fall
G.W.R.				
Cons. Ord. ...	55½	44½	50½	+½
5% Con. Prefce. ...	124	108	121½	–1
5% Red.Pref.(1950)	117	106⅝	110½	—
4% Deb.	118½	108	115½	–1
4½% Deb. ...	122	110	117½	—
4½% Deb. ...	129½	118	126½	—
5% Deb.	140¼	130	137½	—
2½% Deb.... ...	82¼	68½	76	—
5% Rt. Charge ...	137	128	134½	—
5% Cons. Guar. ...	136¾	120½	134½	—
L.M.S.R.				
Ord.	25 5/16	16	18½	—
4% Prefce. (1923)	58¼	43½	56½	—
4% Prefce. ...	87½	73½	84	–½
5% Red.Pref.(1955)	107	97¾	104½	—
4% Deb.	110¼	99½	108	–½
5% Red.Deb.(1952)	119 11/16	111 5/16	117½	—
4% Guar.... ...	105⅝	95½	103½	—
L.N.E.R.				
5% Pref. Ord. ...	15⅞	8¼	10	—
Def. Ord.	7 9/16	4¾	5½	—
4% First Prefce....	74¾	48	57	—
4% Second Prefce.	31⅝	16¼	20	—
5% Red.Pref.(1955)	92¼	71	78½	—
4% First Guar. ...	103 11/16	93	100*	–1½
4% Second Guar.	98¾	82½	92*	–1½
3% Deb.	86	75	82	–1
4% Deb.	109¼	98½	107½	—
5% Red.Deb.(1947)	118½	106½	115½	—
4½% Sinking Fund Red. Deb.	112½	108	110	—
SOUTHERN				
Pref. Ord.... ...	87½	69⅝	87	+1
Def. Ord. ...	25 13/16	16⅝	22½	+½
5% Prefce. ...	124	108¼	122½	—
5% Red.Pref.(1964)	117¾	109½	115½	—
5% Guar. Prefce.	136½	121½	134½	—
5% Red.Guar.Pref. (1957)	121¼	112½	116½	—
4% Deb.... ...	116¾	107	115	–1
5% Deb.	138	130¼	136½	—
4% Red. Deb. 1962–67	115	106½	115	—
BELFAST & C.D.				
Ord.	9	4	9	—
FORTH BRIDGE				
4% Deb.	111¼	104½	104½	—
4% Guar. ...	109⅞	104	104½	—
G. NORTHERN (IRELAND)				
Ord.	20	7	17	—
G. SOUTHERN (IRELAND)				
Ord.	57½	14½	41	—
Prefce.	50	25¼	50½	—
Guar.	88¾	51¼	88	—
Deb.	86¼	70	89	—
L.P.T.B.				
4½% "A" ...	130	119¾	127	—
5% "A" ...	139¾	130	136½	—
4½% "T.F.A." ...	113¾	108	110	+½
5% "B" ...	131½	122¾	130½	—
"C"	109½	91	109½	–2
MERSEY				
Ord.	23⅛	9¼	29½	—
4% Perp. Deb. ...	100½	93½	97½*	–1
3% Perp. Deb. ...	75½	67	76*	—
3% Perp. Prefce.	62	47¼	66½	—

* ex dividend

CONTRACTS AND TENDERS

S. H. Heywood & Co. Ltd. has received an order from the Buenos Ayres Western Railway for one overhead electric travelling crane.

New Locomotives and Coaches, L.N.E.R.

The L.N.E.R. is to put in hand construction of 17 Pacific locomotives similar to the *Silver Link* streamlined engine, and five other locomotives of a new design for mixed traffic, at the Doncaster shops, under the Government Guaranteed Loan. In addition, 225 coaching stock vehicles are to be built, mainly by outside contractors. These will include a number of first class restaurant and sleeping cars, together with 214 first and third class vestibuled coaches.

William Beardmore & Co. Ltd. has received an order for 26 pairs of wagon wheels and axles for the Madras & Southern Mahratta Railway, to be supplied to the inspection of Messrs. Rendel, Palmer & Tritton.

Bridgework for India

Head, Wrightson & Co. Ltd. has received an order for a swing bridge for the Junagad State Railway. The bridge will be supplied to the inspection of the consulting engineers, Messrs. Robert White & Partners, and will be 70 ft. in length, with an overall width of 21 ft. It is to be of the centre pivot type, and will be erected across a tidal channel leading to Veraval harbour.

P. & W. MacLellan Limited has received an order from the Cordoba Central Railway for 370 mild steel plates required for the construction of 10 travelling petroleum tanks.

The Berlin correspondent of *The Financial Times* reports that two German wagon building firms have received an order totalling about £166,000 from the Piræus-Athens-Peloponnesus Railway, to include 16 four-axle railcars, four vehicles with a refreshment section and 100 goods wagons.

The L.M.S.R. is to instal colour-light signalling on the main Midland line between Carlton Road junction (Kentish Town) and Finchley Road (West Hampstead). See news paragraph on page 168.

Leyland Motors Limited has received the following orders from railway and railway-associated road transport operators: New Zealand Government Railways, Cub vehicle; N.S.W. Department of Road Transport, Tiger and Titan vehicles; and Dublin United Tramways Co. (1896) Ltd., 20 oil-engined Lions.

The Bombay, Baroda & Central India Railway Administration has placed orders to the inspection of Messrs. Rendel, Palmer & Tritton as follow: Fried. Krupp A.G., 18,000 volute springs and 569 helical springs; Geo. Turton, Platt & Co. Ltd., 200 mild steel buffers for four-wheeled stock; Dorman Long & Co. Ltd., 690 galvanised corrugated roof sheets for Z class wagons.

G. R. Turner Limited has received an order from the Buenos Ayres Great Southern Railway for 100 sets of ironwork required for the conversion abroad of cattle wagons to composite wagons.

Newcastle Central Signalling

When the renewal of the signalling apparatus at and in the vicinity of Newcastle Central station, L.N.E.R., is carried out during the present year, the existing semaphore signals will be replaced by colour-light signalling similar to that at present installed on the main line between York (Poppleton junction) and Northallerton.

The English Steel Corporation has received an order from the Bikaner State Railway Administration for 600 high tensile steel carriage and wagon tyres to be supplied to the inspection of Messrs. Rendel, Palmer & Tritton.

A considerable improvement is noted in the German locomotive export trade, says a message from Berlin to Reuters Trade Service. For the first nine months of 1935 the total value of locomotives exported was RM. 5·8 million, compared with 1·7 million for the same period of 1934 and 1·9 for the same period of 1933. The best customers were Turkey, Bulgaria, Brazil, China, and South Africa.

G.W.R. Carriage Construction

The following letter was published in *The Daily Express* of January 23, in correction of an error in its previous issue:—

With reference to your leading article regarding the use of steel in the construction of railway carriages, you are under a complete misapprehension in stating that the Great Western Railway Company has not taken my advice in this matter. As a matter of fact, the only pattern of coach we have built since 1922 consists of a massive steel underframe, to which is lightly attached a body separately constructed and entirely cased in steel, built on a timber framework and fitted with a steel roof. We have at present in service over 3,000 of these vehicles.

C. B. COLLETT,
Chief Mechanical Engineer, Great Western Railway

INSTITUTE OF BRITISH EXECUTIVES.—We are advised that, owing to the continual increase in membership and general expansion of the work of the institute, need for greater accommodation has been felt for a long time. As from January 27, the address will be Swan House, 79, High Holborn, W.C.1. These new premises are self-contained on two separate floors; the first floor provides a spacious club room with reading and writing rooms adjoining, and the second floor administration offices, &c. The General Secretary is Mr. Guy F. Dowding.

BRITISH AMBASSADOR IN NANKING AND BRITISH RAILWAY INTERESTS.—It is understood in Peiping that one of the main objects of the visit to Nanking of Sir Alexander Cadogan, British Ambassador to China, on January 10, was to discuss the protection of British railway interests in North China, states a Reuters message. These are threatened, it is feared, by the possibility that the Hopei-Charar political council may hold up the revenues earmarked for interest payments on the railway loans. The Japanese military spokesman at Tientsin is said to have thought that some arrangement could be made to satisfy all parties. The question of holding up the customs dues and the salt and railway revenues was under consideration, he added. This visit was regarded in political circles as evidence of the importance which Britain attached to the forthcoming negotiations between the Chinese and Japanese Governments, for it should be remembered that British railway interests in North China are determined by the financing of the Peiping-Mukden railway by British capital, and of the Tientsin-Pukow railway with capital half German and half British.

POSTER ADVERTISING FOR MONACO.—The National Touring Office of Monaco has issued a poster illustrating the principality as seen from the cliffs overlooking the headland on which the palace is situated. The latter forms the principal subject in a view showing the harbour, the bay, and a glimpse of the coastline towards Menton. Composition and colouring gain in effectiveness through the exercise of a restraint in both matters which gives the poster an insistent appeal.

SOIL MECHANICS AND FOUNDATION ENGINEERING CONFERENCE.—From June 22 to 26, 1936, the first International Conference on Soil Mechanics and Foundation Engineering will be held at Harvard University, Cambridge, Mass., U.S.A. Fourteen subjects for papers have been decided upon, and no limit has been set upon the number that may be accepted, though only a selected few will be chosen for reading and discussion. Intending contributors are required to submit a 100-word description of their papers to the secretary not later than March 15 next. A synopsis of the subjects to be considered by the conference, and a provisional programme of meetings and excursions, may be obtained from the Secretary, Foundation Conference, Harvard Engineering School.

OFFICIAL NOTICES

South Indian Railway Company Limited

THE Directors are prepared to receive Tenders for the supply of :—
1. Copper Plates (Flat and Flanged).
2. Steel Axles.

Specifications and Forms of Tender will be available at the Company's Offices, 91, Petty France, Westminster, S.W.1.

Tenders addressed to the Chairman and Directors of the South Indian Railway Co. Ltd., marked "Tender for Copper Plates," or as the case may be, with the name of the firm tendering, must be left with the undersigned not later than 10 a.m. on Friday, the 7th February, 1936.

The Directors do not bind themselves to accept the lowest or any tender.

A charge, which will not be returned, will be made of 10s. for each copy of Specification No. 1, and of 5s. for each copy of Specification No. 2.

Copies of the drawings may be obtained at the Offices of the Company's Consulting Engineers, Messrs. Robert White & Partners, 3, Victoria Street, London, S.W.1.

E. A. S. BELL,
Managing Director.

91, Petty France,
Westminster, S.W.1.
22nd January, 1936.

Traction

LARGE concern requires for leading position an Electrical Engineer with extensive experience in traction matters, more particularly operating conditions and motor construction. Apply giving full details, experience, training, and salary required, to Box No. 20, c/o THE RAILWAY GAZETTE, 33, Tothill Street, London, S.W.1.

London & North Eastern Railway

NOTICE IS HEREBY GIVEN that the Directors have fixed 31st January at the close of business as the date for striking the Balances of the Company's Guaranteed, Preference and Ordinary Stocks. Final Dividends declared for the year ended 31st December, 1935, will be payable only to the Stockholders whose names are registered in the books of the Company on the date so fixed.

Deeds of Transfer should, therefore, be lodged with the Registrar of the Company at Hamilton Buildings, Liverpool Street Station, London, E.C.2, before 5 p.m. on 31st January.

By Order,
JAMES McLAREN,
Secretary.

Marylebone Station,
London, N.W.1.
21st January, 1936.

The Chinese Government Purchasing Commission

THE Commission is prepared to receive Tenders from British manufacturers only for the supply of :—

(*a*) 186 TYRES and 60 AXLES;
(*b*) 126 HELICAL SPRINGS;
(*c*) LOCOMOTIVE SPARE PARTS.

Tender documents can be obtained at the Offices of the Consulting Engineers, MESSRS. SANDBERG, 40, Grosvenor Gardens, London, S.W.1.

Non-returnable fees will be charged for each set of documents : (*a*) £1; (*b*) 5s.; (*c*) £1.

Cranes for Sale

TWO Steam Loco. Cranes manufactured by Sir William Arrol & Co. Ltd. in 1934.

Gauge 12 ft. 0 in. which can be altered to 4 ft. 8½ in. or any intermediate gauge.

Wheelbase 10 ft. 3 in.; jib 40 ft.

Load 6 tons at 24 ft. radius and 4 tons at 30 ft. radius. for 12 ft. gauge.

Load 5 tons at 20 ft. radius for 4 ft. 8½ in. gauge.

Boiler for 100 lb. pressure.

Full particulars from Sir William Arrol & Co. Ltd., Waterloo Bridge, Victoria Embankment, W.C.2.

PATENTS for Inventions, Trade Marks, Advice, Handbook, and consultations free. King's Patent Agency, Ltd. (B. T. King, C.I.M.E., Registered Patent Agent, G.B., U.S., and Canada), 146A, Queen Victoria Street, London, E.C.4. 49 years' references. 'Phone City 6161.

Universal Directory of Railway Officials and Railway Year Book

This unique publication gives the names of all the principal railway officers throughout the world, together with essential particulars of the systems with which they are connected. Much general and statistical information about railways is also concisely presented.

Price 20/- net.

THE DIRECTORY PUBLISHING CO. LTD., 33, Tothill Street, London, S.W.1

RAILWAY AND OTHER REPORTS

Great Northern Railway (Ireland).—The Board, after transferring the sum of about £9,500 from reserves, has resolved, subject to audit, to recommend to the proprietors the payment of a final dividend of £2 per cent. (less income tax) on the consolidated 4 per cent. guaranteed stock for the year ended December 31, 1935. The directors regret that the improvement in the total net income has not been sufficient to permit of the payment of dividends on the consolidated 4 per cent. preference and the ordinary stocks.

South Behar Railway.—This railway of 79 miles on the 5 ft. 6 in. gauge is worked by the East Indian State Railway, and is leased to the Secretary of State for India at a yearly rental of £30,000, which is equivalent to 5 per cent. on the capital stock after paying debenture interest and administration expenses. The directors in their report for the year 1935 record the payment of an interim dividend on July 31 last at the rate of 5 per cent. per annum, and the receipt of £30,000 from the Secretary of State, and recommend the payment of a final dividend at the same rate, leaving £5,279 to be carried forward.

Midland Railway Company of Western Australia.—Gross traffic receipts (in Australian currency) for the year ended June 30, 1935, amounted to £159,574, an increase of £1,367 in comparison with the previous year. In the working expenses of £71,102 there was a saving of £1,017, so that net receipts were £2,384 higher, at £88,472. Working expenses were 44·56 per cent. of gross receipts. After including £20,310 brought forward, and transferring £3,000 to taxation reserve account and £30,000 to depreciation and renewals account, and paying interest (£5,835) on the 4½ per cent. first mortgage debenture stock, there remains a balance of £56,910, out of which the sum of £29,618 is appropriated for interest on the second mortgage cumulative income debenture stock at 5 per cent. for the year to June 30, 1935, leaving £27,292 to be carried forward. A sum of £27,084 has been charged to depreciation and renewals account for expenditure during the year, in addition to ordinary maintenance, on repairs, renewals of rails, sleepers, reballasting, and rolling stock.

Leyland Motors Limited.—The report and accounts for the twelve months to September 30, 1935, show that after making provision for taxation and after transferring £100,000 to the general reserve so as to increase it to a total of £600,000, there remains a balance available of £197,890. The directors recommend payment of a dividend upon the ordinary shares of 17½ per cent., leaving £49,380 to be carried forward. Full depreciation has been written off land, buildings and plant and machinery, and adequate reserves have been made for bad debts and contingencies.

East Yorkshire Motor Services Limited.—Controlled jointly by the London & North Eastern Railway and Tilling & British Automobile Traction Limited, this company secured a total revenue of £263,844 (against £251,061 for 1933-34) for the year to September 30, 1935. The balance, after deducting expenses and depreciation, is £45,406 (against £34,343), and adding £7,753 (against £13,410) brought forward makes a total of £53,159 (against £47,753). The directors have appropriated £20,000 (against £10,000) to general reserve and £24,000 (against £20,000) to a dividend of 10 per cent. for the year, leaving £9,159 to be carried forward. The authorised capital was increased during the year by the creation of 50,000 shares of £1 each, and the issued capital increased by the allotment of 40,000 shares of £1 each. Binnington's Motors Limited, one of the company's subsidiaries, has been liquidated and merged into the business of the company. The omnibus business of Sharpe's Motors Limited has been acquired jointly with the Hull Corporation.

National Provincial Bank Limited.—Net profit for the year 1935 amounts to £1,665,437, to which has to be added £878,881 brought forward from last account, making a total of £2,544,319, from which the following appropriations have been made :—£710,956 for interim dividend of 7½ per cent., subject to tax, paid in July last ; £710,956 for a further dividend of 7½ per cent., subject to tax, payable on January 31 ; £100,000 to pension fund ; and £100,000 to bank premises account, leaving £922,406 to be carried forward. The total number of branches and agencies now open is 1,343.

Forthcoming Meetings

Jan. 30 (*Thurs.*).—**Bengal & North Western Railway Co. Ltd.** (Ordinary General), Winchester House, Old Broad Street, E.C., at 12 noon.

Jan. 30 (*Thurs.*).—**National Provincial Bank Limited** (Annual General), Southern House, Cannon Street, E.C.4, at 12 noon.

Jan. 30 (*Thurs.*).—**Midland Railway Co. of Western Australia Ltd.** (Ordinary General), Winchester House, Old Broad Street, E.C., at 12 noon.

Railway Share Market

The stock and share markets resumed business on Wednesday, the Stock Exchange having been closed on the previous day as a mark of respect for the late King. As was to be expected there was a distinct quietness about business and the amount put through was in smaller proportions than would otherwise have been the case. In home railway stocks there are the impending financial statements of the past year's results which would ordinarily attract special attention. Notwithstanding the nominal character of the market at times this week there has been a good undertone in Southern preferred which is being influenced by the expectation of a favourable decision by the House of Lords in regard to the rating appeal.

The Stock Exchange was anticipating the announcement of the judgment at the end of the week. Should the decision be favourable to the Southern company it is estimated that the directors would be in a position to pay the full 5 per cent. dividend on the preferred ordinary stock for 1936. The question as to the claims of the railwaymen for the restoration of the balance of the "cut" in wages is not, however, left out of consideration by the market, hence the relatively low quotation which is still being made for the stock. It is estimated in the Stock Exchange that the saving to the other railway companies of a proportionately reduced assessment would be equivalent to 2½ per cent. on the London Midland & Scottish 1923 preference stock, 1¾ per cent. on the London & North Eastern first preference stock and nearly one per cent. on the Great Western ordinary stock. In other directions the chief interest in railway stocks has been in the foreign railway market where Argentine stocks came into strong demand on hopes of an early announcement of new exchange remittance arrangements following the Cabinet meeting held in Buenos Aires last week to consider the question of a renewal of the Anglo-Argentine trade agreement.

The market was not well supplied with stock as holders show no disposition to realise stocks at the heavy depreciation now shown. Reference was made here some weeks ago to the fact that £100 nominal of each of the four leading Argentine railway ordinary stocks could be purchased for a total outlay of about £50 and whilst the aggregate cost is now greater the group is still being bought by many investors for locking away on the prospect of ultimate recovery.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1935-36	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1935	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1935	Prices: Lowest 1935	Prices: Jan. 22, 1936	Yield% (See Note)
South & Central America.	Antofagasta (Chili) & Bolivia	830	19.1.36	£ 18,110	+ £ 7,200	3	£ 41,210	£ 28,660	+ £ 12,550	Ord. Stk.	23	14 15/16	23	Nil
	Argentine North Eastern	753	18.1.36	7,133	+ 670	29	230,071	213,540	+ 16,531	„	7	4	6	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	A. Deb.	49 1/2	30	47 1/2	8 7/16
	Bolivar	174	Dec., 1935	4,700	— 1,000	52	71,300	71,400	— 100	6 p.c. Deb.	13	5	10	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	14	11	13	3 15/16
	Buenos Ayres & Pacific	2,806	18.1.36	90,129	+ 16,627	29	2,206,212	1,997,593	+ 208,619	Ord. Stk.	101 1/2	47 8	10	Nil
	Buenos Ayres Central	190	4.1.36	$114,700	+ $29,700	27	$3,255,800	$3,201,100	+ $54,700	Mt. Deb.	21	10	13	Nil
	Buenos Ayres Gt. Southern	5,085	18.1.36	150,411	— 26,381	29	3,532,745	3,670,853	— 138,108	Ord. Stk.	27	13 1/2	22 1/2	Nil
	Buenos Ayres Western	1,930	18.1.36	49,941	+ 4,700	29	1,216,836	1,211,300	+ 5,536	„	24	10	18 1/2	Nil
	Central Argentine	3,700	18.1.36	141,275	+ 10,764	29	3,441,990	3,351,639	+ 90,351	„	17 7/8	7	14 1/2	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	9	3 1/4	6	Nil
	Cent. Uruguay of M. Video	273	11.1.36	11,002	— 747	28	285,538	434,210	— 148,672	Ord. Stk.	8 1/2	3	6	Nil
	Do. Eastern Extn.	311	11.1.36	2,143	— 489	28	47,762	51,261	— 3,499	—	—	—	—	—
	Do. Northern Extn.	185	11.1.36	1,380	+ 159	28	34,248	27,723	+ 6,525	—	—	—	—	—
	Do. Western Extn.	211	11.1.36	778	— 101	28	21,746	21,382	+ 364	—	—	—	—	—
	Cordoba Central	1,218	18.1.36	26,910	—	29	858,530	857,960	+ 570	Ord. Inc.	4	1	2	Nil
	Costa Rica	188	Nov., 1935	13,350	— 4,170	22	68,699	81,005	— 12,306	Stk.	35	30	34	5 7/8
	Dorada	70	Dec., 1935	14,000	+ 5,900	52	144,700	120,900	+ 23,800	1 Mt. Db.	103 5/8	102 1/2	102 1/2	5 7/8
	Entre Rios	810	18.1.36	11,040	— 4,506	29	327,778	360,353	— 32,575	Ord. Stk.	15	6 1/2	11	Nil
	Great Western of Brazil	1,082	18.1.36	11,200	— 600	3	26,300	29,500	— 3,200	Ord. Sh.	1/2	5/16	1/2	Nil
	International of Cl. Amer.	794	Dec., 1935	$458,840	+ $47,975	52	$4,717,930	$4,722,778	— $4,848	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	1/2	3/32	1/2	Nil
	La Guaira & Caracas	22 1/4	Dec., 1935	4,200	+ 1,000	52	45,345	42,350	+ 2,995	S.k.	8 1/2	8	8 1/2	Nil
	Leopoldina	1,918	18.1.36	18,450	+ 960	3	48,767	49,519	— 752	Ord. Stk.	8 1/2	2 1/2	9	Nil
	Mexican	483	14.1.36	$252,000	+ $27,100	2	$457,100	$416,400	+ $40,700	„	1 1/2	1/4	3/4	Nil
	Midland of Uruguay	319	Dec., 1935	7,995	— 5,513	26	38,696	65,833	— 27,137	„	1 1/2	1 1/2	1 1/2	Nil
	Nitrate	401	15.1.36	9,951	+ 5,251	2	9,951	4,700	+ 5,251	Ord. Sh.	64/-	42/-	25 8	Nil
	Paraguay Central	274	18.1.36	$2,251,000	+ $1,199,000	29	$60,216,000	$28,895,000	+ $31,321,000	Pr. Li. Stk.	80 1/2	60	76 1/2	7 13/16
	Peruvian Corporation	1,059	Dec., 1935	78,507	+ 16,529	26	454,297	371,516	+ 82,781	Pref.	10 5/8	6 7/16	10	Nil
	Salvador	100	11.1.36	¢29,800	— ¢4,200	28	¢411,696	¢393,152	+ ¢18,544	Pr. Li.Db.	65	61	65	7 11/16
	San Paulo	153 1/2	12.1.36	23,474	+ 3,229	2	49,506	39,948	+ 9,558	Ord. Stk.	80	35	57	4 5/8
	Taltal	164	Dec., 1935	4,055	+ 1,915	26	20,700	13,570	+ 7,130	Ord. Sh.	1 11/16	1 1/8	1 3/8	7 1/4
	United of Havana	1,353	18.1.36	18,132	+ 1,963	29	448,709	467,383	— 18,674	Ord. Stk.	3 1/16	1	2	Nil
	Uruguay Northern	73	Dec., 1935	1,086	— 442	26	4,719	7,294	— 2,575	Deb. Stk.	4 1/2	2 15/16	4 1/2	Nil
Canada.	Canadian National	23,684	14.1.36	606,540	+ 59,803	2	1,123,403	1,034,054	+ 89,349	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	— 4 p.c	Perp. Dbs.	78 5/8	52 1/2	64 1/2	6 3/16
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	103 5/8	93	101 1/2	3 15/16
	Canadian Pacific	17,224	14.1.36	407,400	+ 20,600	2	810,600	756,200	+ 54,400	Ord. Stk.	14 1/16	8 5/4	11	Nil
India.†	Assam Bengal	1,329	31.12.35	35,497	— 4,564	39	933,034	1,060,251	— 127,217	Ord. Stk.	92 1/8	77 1/2	82 1/2	3 5/8
	Barsi Light	202	31.12.35	4,672	— 1,065	39	105,847	106,882	— 1,035	Ord. Sh.	105	77 1/2	77 1/2	6 7/16
	Bengal & North Western	2,112	31.12.35	76,816	— 5,593	39	622,176	625,564	— 3,388	Ord. Stk.	30 11 1/2	291	293 1/2	5 7/16
	Bengal Dooars & Extension	161	20.12.35	3,729	— 555	38	102,739	114,617	— 11,878	„	12 7 1/2	122	123 1/2	5 11/16
	Bengal-Nagpur	3,268	30.11.35	178,875	+ 8,849	34	4,202,711	3,848,353	+ 354,358	„	105	100 5/16	101 1/2	3 15/16
	Bombay, Baroda & Cl. India	3,072	10.1.36	261,525	— 12,375	41	6,215,550	6,247,800	— 32,250	„	11 5 1/4	110	110 1/2	5 7/16
	Madras & Southern Mahratta	3,230	29.12.35	154,575	+ 6,503	38	3,775,132	4,029,420	— 254,288	„	12 8 1/2	113 7/8	115 1/2	7 1/4
	Rohilkund & Kumaon	572	31.12.35	17,361	— 875	39	113,405	118,696	— 5,291	„	29 4	26 2	28 7 1/2	5 9/16
	South India	2,526	20.12.35	99,943	— 11,926	38	2,843,121	2,999,850	— 156,729	„	11 9 3/4	10 4 1/4	10 5 1/2	7 1/8
Various.	Beira-Umtali	204	Nov., 1935	64,179	— 176	9	129,926	125,490	+ 4,436	—	—	—	—	—
	Bilbao River & Cantabrian	15	Dec., 1935	1,516	— 98	52	18,469	19,947	— 1,478	—	—	—	—	—
	Egyptian Delta	622	31.12.35	8,395	+ 1,218	39	189,824	180,254	+ 9,570	Prf. Sh.	2	1 5/8	1 3/4	5 11/16
	Great Southern of Spain	104	11.1.36	1,031	— 1,164	2	2,017	4,394	— 2,376	Inc. Deb.	3 1/2	2	3 1/2	Nil
	Kenya & Uganda	1,625	Nov., 1935	182,196	+ 11,855	48	2,184,339	2,030,213	+ 154,126	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	48	36	45	7 3/4
	Mashonaland	913	Nov., 1935	101,719	— 13,519	9	213,702	232,511	— 18,809	1 Mg. Db.	104 1/4	100	102 1/2	4 7/8
	Midland of W. Australia	277	Nov., 1935	14,519	— 556	22	68,781	71,429	— 2,648	Inc. Deb.	98 3/4	93	92 1/2	5 8
	Nigerian	1,905	7.12.35	62,822	— 5,665	36	1,118,091	1,220,148	— 102,057	—	—	—	—	—
	Rhodesia	1,538	Nov., 1935	187,828	+ 2,351	9	390,522	375,036	+ 15,486	4 p.c. Db.	105 1/2	101	104	3 7/8
	South African	13,246	28.12.35	539,009	+ 77,723	39	22,164,592	19,998,581	+ 2,166,011	—	—	—	—	—
	Victoria	4,728	Sept., 1935	789,330	+ 82,793	13	2,238 853	2,139,677	+ 99,176	—	—	—	—	—
	Zafra & Huelva	112	Nov., 1935	9,907	— 1,655	48	124,030	127,888	— 3,858	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements from July 1 onwards are based on the current rates of exchange and not on the par value

Diesel Railway Traction

Labour Troubles on the Diesel

ONE of the principal claims made for diesel railway vehicles of practically all types is that only one man is required at the controls instead of two as on steam locomotives, but it would appear that, so long as a man must be a producer before he may consume, this advantage, regarded in the widest sense, is apt to be more nebulous than real. The subject of one-man operation has been brought to a head in the U.S.A. by the Brotherhood of Locomotive Firemen and Enginemen which threatened a strike of 1,500 men on the Burlington Railroad if an assistant to the driver was not carried on the Burlington Zephyr trains and also on the diesel shunting locomotives. After negotiations, the railroad conceded the demand for two men on the high-speed trains, although they felt that these trains were quite safe when driven by one man, and the Brotherhood agreed to withhold its demands regarding shunting locomotives. As a result, the operating cost of the Zephyr trains will go up from the present figure of about 17d. per train-mile to something like 20·5d. It will, of course, be much more pleasant for the second man, in return for a reasonable fee, to travel backwards and forwards on these high-speed trains at the expense of the railway company, than to wander the streets without visible means of subsistence, or at the expense of a grudging public relief authority. But that is not the way to promote economy, and at once raises the question of why attempts should be made to save labour if the object of industrial activity is to provide work.

South American Successes

MONEY exchange difficulties have tended to retard the rapid development of the oil-engined railway vehicle in Argentina, where the advantages of this form of traction are realised to the full. If currency factors could be eliminated it is extremely probable that considerable orders would be placed in this country by British-controlled companies, for in his annual speeches to the shareholders of the Buenos Ayres Great Southern and Buenos Ayres Western Railways Sir Follett Holt has emphasised the future which awaits diesel units in South America and has intimated that it is unlikely that the B.A.G.S. Railway will acquire further steam locomotives. Sir Follett Holt's confidence was doubtless based upon the encouraging performances of the vehicles already at work on his lines. For instance, the two 1,200 b.h.p. Sulzer-engined mobile power houses sent out to the B.A.G.S. in 1929 have covered an aggregate of 356,000 miles in frequent-stop suburban service to the end of 1935, and the three 1,700 b.h.p. power houses with two 850 b.h.p. Sulzer engines shipped by Armstrong-Whitworth at the beginning of 1933, covered an aggregate of 485,000 miles from June, 1933, to the end of 1935, this mileage also being made in suburban service, but with stops at somewhat longer intervals than on the 1,200 b.h.p. service. The 1,700 b.h.p. locomotive, which has been used in both passenger and goods service, has built up a mileage of 220,897 km. (137,000 miles) from going into main line service on December 4, 1933, until December 19, 1935, a yearly average of nearly 70,000 miles. In the first seven months of its service it covered 91,674 km. (57,000 miles). The Buenos Ayres Great Southern Railway now has diesel experience amounting to 2,000,000 km. (1,240,000 miles). Even more encouraging results have been obtained on the Buenos Ayres Western Railway, where, in the first year of its service, the 450 b.h.p. Armstrong-Sulzer-engined vehicle covered 120,000 miles without any failure on the road being marked up against it, while the 140 b.h.p. Armstrong-Saurer-engined car was totting up a mileage of 50,637 in 44 weeks from the date on which it was turned over to the traffic department.

Features of German Diesel Operation

BY the public, both railway and general, the diesel developments on the German State Railway are summed up usually in the words "Flying Hamburger." The publicity given to this, the first super-speed train in the world, has tended to obscure the large mileages covered daily by vehicles of a more humble type, which are an everyday sight to thousands of Germans who have seen the Hamburger and its 13 counterparts only from a seat in the stalls. Nevertheless, the interest which the first streamliner aroused would probably make it true to say what one of the officials of the Burlington Railroad has said of the famous Zephyr, that if for technical reasons it was necessary to scrap it now, the publicity it has brought the railroad would more than counterbalance the first cost.

With railcars of such a variety of types as described elsewhere in this issue, it is to be expected that diesel traction on the Reichsbahn should present many interesting technical features. Elimination of fire risk in the case of accident has been one of the principal reasons for the adoption of diesel engines in place of petrol, and as a result of the railway system being regarded as a national institution which must pull its weight in more than one direction, and assist other industries, the engine and transmission makes are of greater variety than required from the purely railway point of view. Four-stroke engines are ubiquitous, and much progress has been made in the application of Büchi supercharging in powers of 150 to 1,400 b.h.p. Probably no other railway in the world with over a hundred diesel cars has them all equipped with a driving position at each end, and another operating feature is the wide use made of driving trailers, giving twice the seating capacity without the necessity for turning or shunting at each end of the trip. Among the double-bogie cars, over 80 per cent. are fitted with bogie-mounted engines. With the smaller cars making relatively low and slow-speed daily mileages, it is the practice for light repairs to be carried out about every 12,500 miles and heavy repairs after 93,000 to 95,000 miles. A characteristic of the operation of the 820 and 1,200 b.h.p. high-speed trains is that nose-suspended motors of appreciable size are worked regularly for miles on end at 100-104 m.p.h. That this is feasible is an interesting commentary on the trouble which has been experienced with motors of lesser power on multiple-unit electric trains running up to 75-80 m.p.h., although in this case the leading bogie is motored, whereas in the German two and three-car trains the traction motors are located on the centre bogies. But some credit for the satisfactory performance must be given to the outstanding excellence of the permanent way on the German main lines. Air brakes with regulation of the braking force according to the speed are used on the new high-speed trains and, to provide extremely high rates of retardation in case of emergency, powerful electro-magnetic rail brakes are applied in conjunction with the air brake.

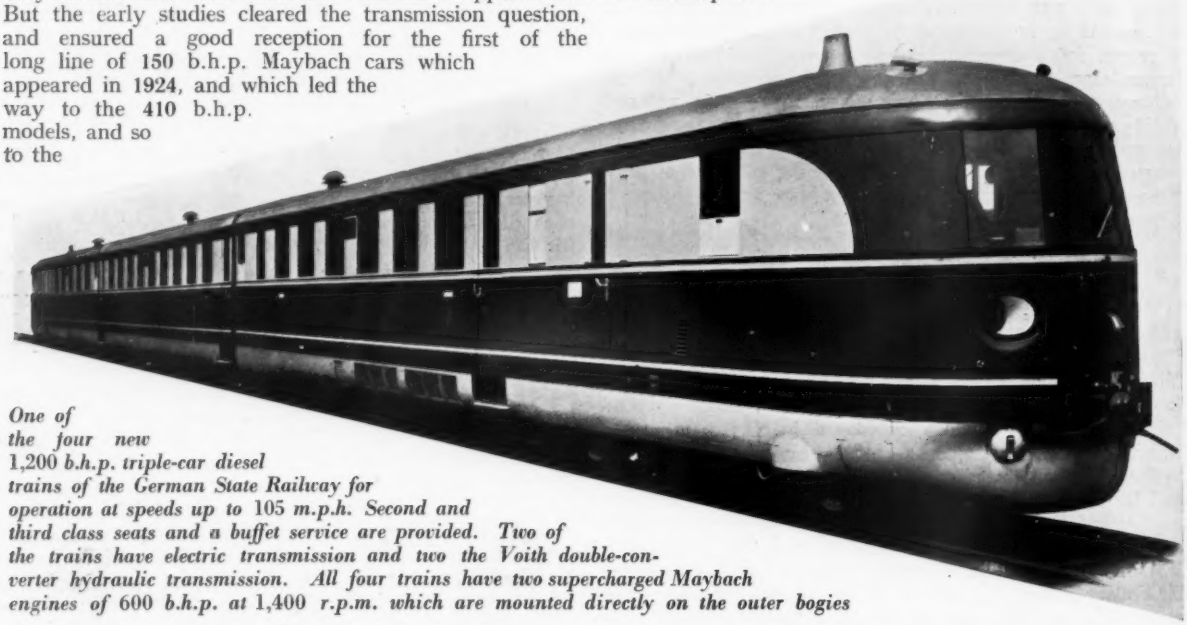
DIESEL TRACTION ON THE REICHSBAHN*

An account of its growth and a note on the standard types of vehicles

By BRIAN REED

WHEN in 1920—against the advice of Trotsky and a council of nearly 200 Russian engineers—Lenin lent his personal support to Lomonossoff's proposals for diesel locomotives, he laid a stone in the foundation of the network of diesel services which exists in Germany today, for, on the preliminary specifications for three locomotives being drawn up, the German State Railway, then in the process of fusion, agreed to collaborate in the study of the various types of engines and transmissions.

It is true that the Prussian and Saxon State Railways experimented with diesel-engined units just before the war, but this had no influence on future activities. Actually, the work done in conjunction with the Soviet engineers has shown few direct results, for the studies were confined largely to locomotives, and the Reichsbahn has been singularly unfortunate in its main-line locomotive applications. But the early studies cleared the transmission question, and ensured a good reception for the first of the long line of 150 b.h.p. Maybach cars which appeared in 1924, and which led the way to the 410 b.h.p. models, and so to the streamlined super-speed trains with electric and hydraulic transmission.



One of the four new 1,200 b.h.p. triple-car diesel trains of the German State Railway for operation at speeds up to 105 m.p.h. Second and third class seats and a buffet service are provided. Two of the trains have electric transmission and two the Voith double-converter hydraulic transmission. All four trains have two supercharged Maybach engines of 600 b.h.p. at 1,400 r.p.m. which are mounted directly on the outer bogies

Safety in operation has been one of the main reasons for the concentration on diesel cars in preference to the petrol type, and over 200 are now in operation including the super-speed trains, with another hundred under construction. A feature of them all is a driving cabin at each end, and another characteristic of the railcar position is the number of more or less trial vehicles. The Maybach 150 and 175 b.h.p. gear drive and 410 b.h.p. electric transmission cars may be termed standard, and so may the new 820 b.h.p. twin-car fast trains, or *schnelltriebwagen*. There are numerous four-wheeled cars of 135 to 180 b.h.p. but they have four different types of engine and three different types of transmission of about seven different makes. In addition, there are double-bogie cars with 210 b.h.p. Maybach engines, 300 b.h.p. M.W.M., 300 and 450 b.h.p. Mercedes-Benz, 400, 420 and 560 (supercharged) M.A.N. engines, and three-car 1,200 b.h.p. super-speed trains with two types of transmission.

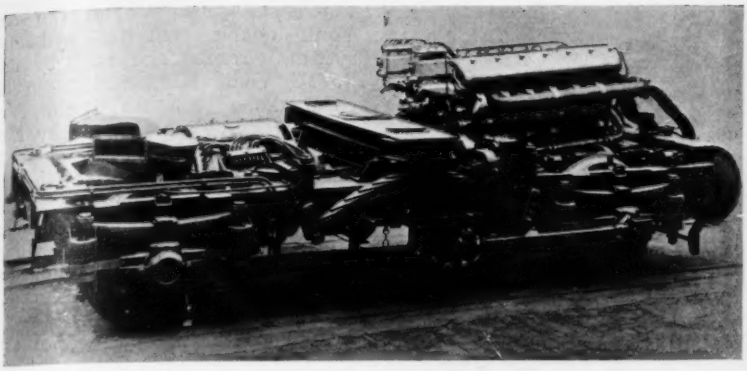
Two-Car Streamlined Cars

From going into regular service between Berlin and Hamburg in May, 1933, until it was withdrawn to go to the Centenary Exhibition at Nuremberg in June, 1935, the *Flying Hamburger* had made 1,100 trips between the two cities, with an aggregate mileage of 202,000 miles made at schedule speeds of 77·4 m.p.h. in the down direction and 76·3 in the up. The availability improved from 71 per cent. in the first half year to 82 per cent. in the second and third, and to 90 per cent. in the fourth. For the whole year 1934 the fuel consumption averaged only 2·7 lb. per mile and the lubricating oil consumption 0·146 lb. per mile. The name *Flying Hamburger* was given to the twin-car set built in 1932, but must now be applied to the service, for the new vehicles built in 1935 take their turn in the roster.

The original train is an articulated two-car unit 137 ft. 6 in. long built by Wumag at Görlitz, with a capacity of 98 second class plus 4 seats in the buffet, and with lavatory and luggage accommodation. The seats are arranged three on one side of the aisle and one on the other. On each outer bogie is mounted a standard 410 b.h.p. Maybach engine and direct coupled Siemens-Schuckert generator, and the articulation bogie carries the two nose-suspended traction motors, each of which develops a maximum tractive effort of 6,600 lb. Gebus control is fitted. The fuel is contained in six cylindrical tanks, three in each engineroom, with a combined capacity of 435 gal.

Two of the principal problems associated with the introduction of the *Flying Hamburger* were the streamlining

* See editorial comment on page 173.



The illustration above shows one of the outer bogies of the new German two-car 820-b.h.p. trains. These bogies carry the 410 b.h.p. Maybach engine and a direct-coupled d.c. generator. On the right is shown the driving cabin of one of these new trains

of the body to enable the power required at high speeds to be kept within reasonable bounds, and the provision of brakes to stop the train from 100 m.p.h. or more. Extensive experiments were made at the Zeppelin works at Friedrichshafen and resulted in an almost completely streamlined contour, the only departure from the best practicable form being the omission of a shroud beneath the vehicles, the side panels merely being turned inwards at the bottom. Compared with a similar vehicle with the contour then favoured for the early 410 b.h.p. cars, the saving in horsepower to overcome the total resistance at 100 m.p.h. is 650, the *Flying Hamburger* loaded to 80 tonnes, requiring about 685 h.p. at the wheel rims. The rolling resistance component of this figure is low, for roller bearing axleboxes are fitted throughout.

The necessary braking power was obtained by fitting a special design of quick-acting Knorr air brake and an electro-magnetic rail brake. The air brake is used for normal stops; it actuates Ferodo-lined shoes applied to special drums on the wheel centres, a separate cylinder being used for each shoe, and the train can be stopped from a speed of 100 m.p.h. in 1,300 yd. The electro-magnetic brake is for emergency application and is used in conjunction with the air brake; with both systems applied together the stopping distance on the level from a speed of 100 m.p.h. is 930 yd. The magnets are suspended from the bogie frame and are lifted clear of the rails by compressed air.

Tests with the *Flying Hamburger* were made on other routes, and in 1934 the construction of further two-car trains of an improved type was begun by Wumag, and 13 of these trains are now in service, operating the Fliegende Kölner and Fliegende Frankfürter trains among others. Fast diesel services with these trains are now running on the undermentioned lines:—

Berlin–Hamburg
Berlin–Frankfort
Berlin–Cologne
Cologne–Hamburg
Berlin–Munich

It is planned to introduce services on the Frankfort-Nuremberg-Stuttgart-Frankfort, Berlin-Königsberg, and Berlin-Breslau lines.

In the design of these trains a number of modifications has been made compared with the original *Flying Hamburger*. The length has been increased to 145 ft. 3 in.,

Two views of the 820-b.h.p. diesel-electric trains built for the German State Railway, and now in service between the German capital and Cologne, Hamburg, Frankfort, Munich, and Leipzig. It is these vehicles which maintain the fastest start-to-stop schedules in the world, viz., 82·3 m.p.h. from Berlin to Hanover and 80·9 m.p.h. from Leipzig to Berlin. The right-hand illustration shows the Flying Cologner on its arrival at Berlin (Zoo) after its 76·3 m.p.h. journey from Hanover

Second class interior of one of the new German high-speed trains

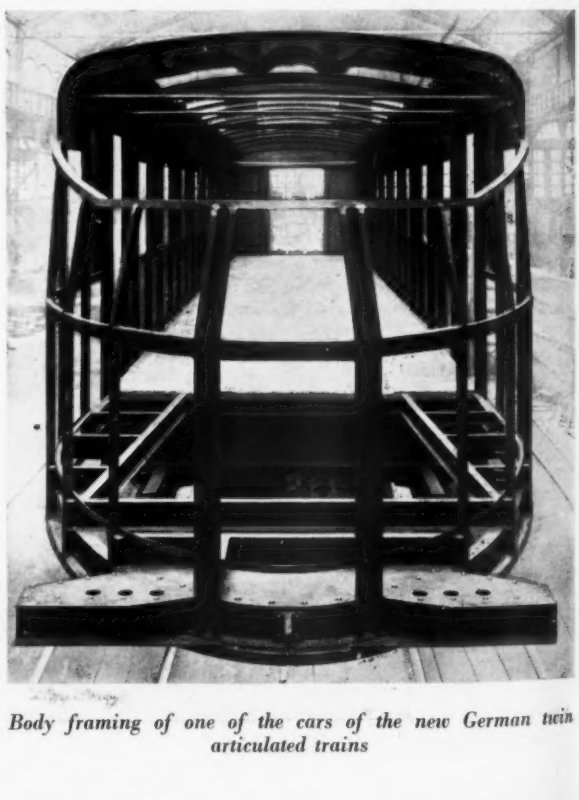
but the seating capacity has been reduced to 77 by providing arm rests for each seat and arranging two on one side of the gangway and one on the other. The tare weight has been raised to 87 tonnes and the weight with fuel and supplies to 91·2 tonnes, whereas the 1932 car tared 74·4 tonnes and scaled 78 tonnes with supplies. The tare weight per seat thus has been increased from 1,605 to 2,490 lb., and the b.h.p. per ton of tare reduced from 11 to 9·5, but from actual observation the speed and accelerative capacities appear to be unimpaired. The 13 new train sets are fitted with Scharfenberg automatic couplers to render them suitable for operation in multiple-unit formation when required.

The Gebus control system has been given up in favour of the RZM type evolved by the Reichsbahn Zentralamt für Maschinentechnik, the feature of which is that any increase in the voltage of the main current causes a corresponding weakening of the field due to separate excitation and shunt-excitation windings. The voltage at the main generator terminals drops appreciably with an increase in main current, and the characteristic curve of the generator thus drops sharply. The RZM system is now standard for all new diesel-electric railcars and trains of the Reichsbahn. The 12-cylinder Maybach engine now weighs 11 lb. per b.h.p. without flywheel or starter compared with 9·8 lb. when first brought out in 1930. Electromagnetic brakes are retained, but it is the policy of the Reichsbahn to avoid fitting this system if at all possible, in view of the considerable weight of the apparatus. The body, underframe, and Jacobs triple-suspension bogies are of 33-ton steel, and welding has been used extensively in the fabrication. Experiments are being made with wheel tyres turned to a taper of 1 in 40.

Triple-Car "Schnelltriebwagen"

The increased capacity which it was felt would be needed if super-speed services were introduced between the German capital and such towns as Leipzig and Dresden, and the desirability of including third class accommodation on such trains, have been met by the construction of four triple-car articulated sets built by Linke-Hoffmann, which, although finished, are not in revenue service at the moment of writing. Two of these rakes have RZM electric transmission, and two the Voith double-converter hydraulic system, designed and built by the J. M. Voith Maschinenfabriken in collaboration with the Triebwagenbau A.G. All are powered by two 12-cylinder Maybach engines practically of the standard 410 b.h.p. G05 type, but with the cylinders increased from 150 mm. to 160 mm. (5·91 in. to 6·3 in.) in diameter and supercharged to give an output of 600 b.h.p. at the same rotational speed of 1,400 r.p.m.

Designed for a top speed of 170 km.p.h. (105 m.p.h.), these 1,200 b.h.p. trains seat 109 third class and 30 second class passengers, but in contrast to the two-car sets, the seats are arranged in compartments with a corridor down the side. The seating and general layout of the 820 b.h.p. twin and 1,200 b.h.p. triple sets may be compared by the diagrams accompanying this article. There is a buffet but refreshments are brought to the compartments, and no seats are fitted adjacent to the buffet counter. Details of the mechanical construction, such as the welded steel body and underframe with panels of 2 and 3 mm. thickness; Jacobs-type motor bogies and triple-suspension power bogies; Jaeger roller bearings; and Scharfenberg couplers for multiple-unit working, are generally similar to those of the new two-car sets, but the bogie centre spacing has been reduced and the length of the train is not proportionately increased, being 195 ft. 8½ in. compared with 145 ft. 3 in. The weight is about 113 tonnes tare, giving ratios of 1,795 lb. per seat and 10·7 lb. per ton. With



Body framing of one of the cars of the new German twin articulated trains

supplies, the weight is increased to 117 tonnes, which is not an unfavourable total.

Hildebrand-Knorr quick-acting automatic single-chamber air brakes are fitted and actuate shoes on special drums as in the Flying Hamburger vehicles; a device for regulating the braking force according to the speed is being tried out. The electro-magnetic braking apparatus is of a comprehensive nature. On each power bogie (the outer pair) are four magnets one metre (39·4 in.) long, and on each driving bogie are two magnets 1·25 metres (49·4 in.) long, which give a maximum combined braking force of 24,300 lbs., and 16,700 lb. with a coefficient of adhesion of 0·065. An emergency application of the air and magnetic brakes can bring the train to rest from 100 m.p.h. in 775 yd. on the level. A third braking system is fitted in the form of a hand-operated oil-controlled brake fitted in each driving compartment, and further braking to hold the train on gradients, in the manner of regenerative control, would be possible in the two train sets fitted with Voith hydraulic transmission, but it is understood that this property will not be used on the super-speed trains, although on certain of the small cars it is used and the brake rigging lightened in consequence.

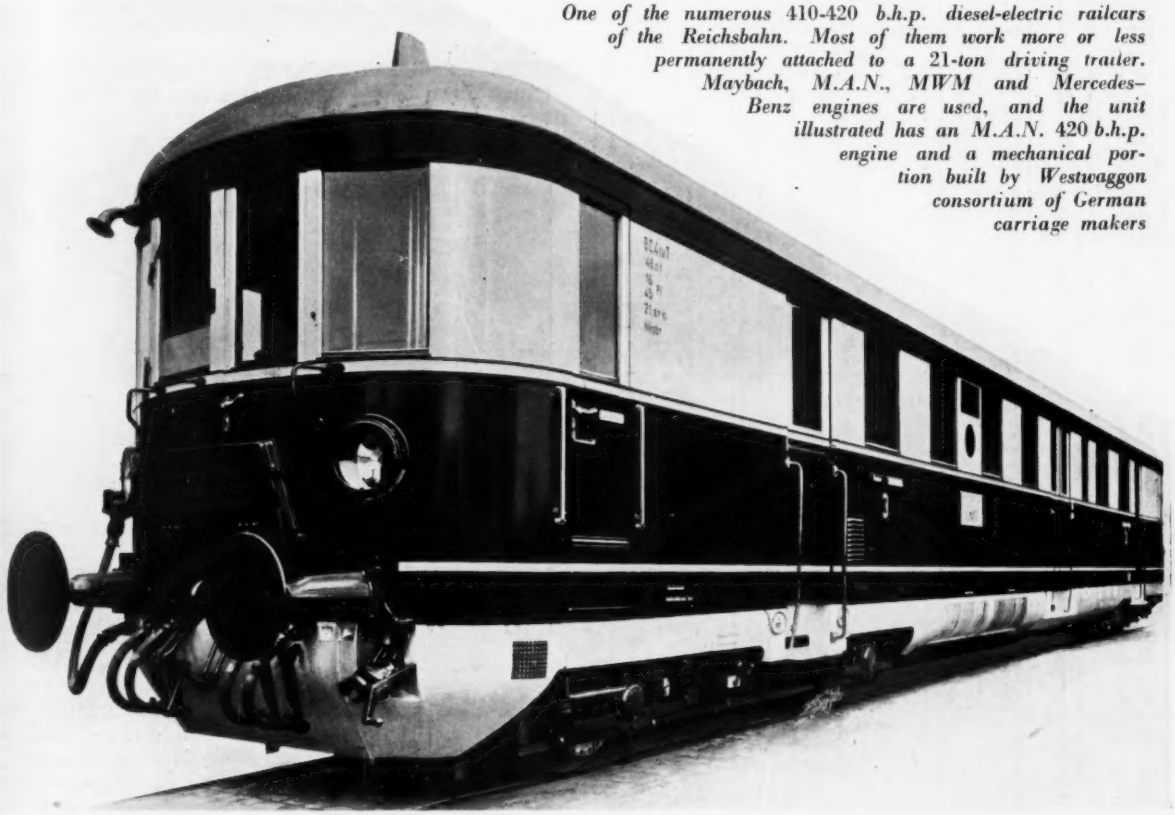
In its proper field the Voith hydraulic transmission is used in two stages, the accelerating converter being in use from starting up to 67 m.p.h., and the normal working converter above that speed. The converters are mounted on the bogie with the engine, but between the engine and converters is installed a gear with a ratio of 1 : 1·33 which raises the primary shaft speed from the 1,400 r.p.m. of the engine to 1,865 r.p.m., thereby making it possible to reduce the size of the transmission, the power of which increases as the cube of the rotational speed. It is a different system from the single converter double-coupling Voith drive used on the Reichsbahn 1,300 b.h.p. diesel locomotive which was illustrated in the May 17, 1935, issue of the *Diesel Railway Traction Supplement*.

Heating of the train is effected by warming the air, which is supplied by fans and passed through a filter before reaching the passenger compartments. The air is heated, when necessary, by the cooling water of the engines, and this is supplemented by water heated in a small horizontal oil-fired boiler located beneath the underframe.

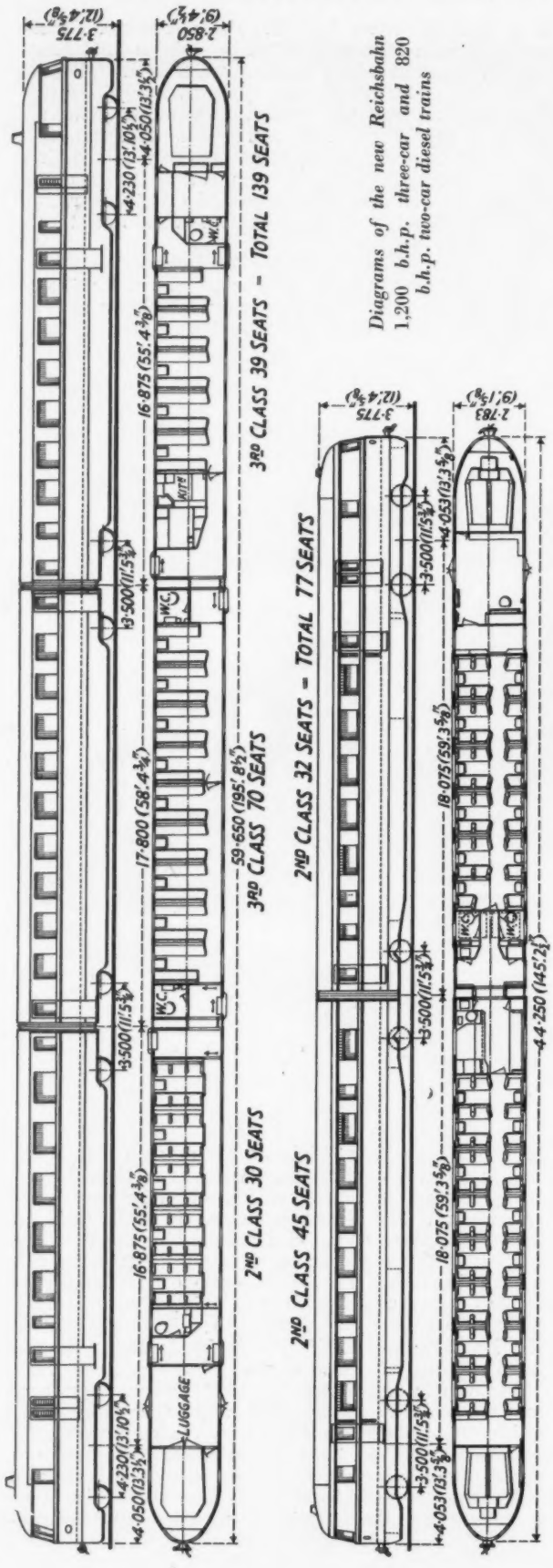
Medium-Power Railcars

Most prolific of all the Reichsbahn railcars, the 410-420 b.h.p. double-bogie electric-transmission vehicles are used largely in conjunction with a bogie driving trailer (although there is a driving cabin at each end of the car) in maintaining intensive interurban services between such towns as Frankfort, Mainz, Wiesbaden, and Darmstadt. The design originated in 1931 with the delivery of three 50-ton cars powered by the then new Maybach 410 b.h.p. engine. These three 72-seater cars operated a shuttle service (in conjunction with driving trailers) between Frankfort and Wiesbaden, making a daily mileage per set of 220. Electric transmission of the Maffei-Schwartzkopff (MSW) fine-control type was fitted and the maximum normal speed was 56 m.p.h.

Three more cars followed in 1932, and were improved in appearance by the adoption of rounded ends. The weight was reduced to 41 tonnes, the seating capacity increased to 76, the top speed raised to 62 m.p.h., and Brown Boveri electric control was embodied. Special light-weight steel bogie-driving trailers were built to go with these cars; they tare 19·5 tonnes and seat 84 passen-



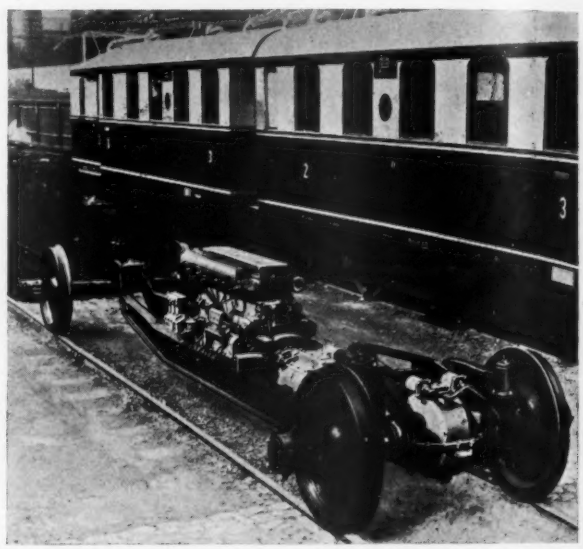
One of the numerous 410-420 b.h.p. diesel-electric railcars of the Reichsbahn. Most of them work more or less permanently attached to a 21-ton driving trailer. Maybach, M.A.N., MWM and Mercedes-Benz engines are used, and the unit illustrated has an M.A.N. 420 b.h.p. engine and a mechanical portion built by Westwaggon consortium of German carriage makers


3rd CLASS 39 SEATS - TOTAL 139 SEATS
2nd CLASS 30 SEATS
3rd CLASS 70 SEATS
2nd CLASS 45 SEATS
2nd CLASS 32 SEATS - TOTAL 77 SEATS
LUGGAGE
W.C.

Diagrams of the new Reichsbahn 1,200 b.h.p. three-car and 820 b.h.p. two-car diesel trains

gers. Two of these cars went to the Halle district and the third to Dresden. Since that time another 81 cars of the same general type with Maybach 410 b.h.p. engines have been built for the Reichsbahn, with the Brown Boveri, Siemens-Schuckert (Gebus), and A.E.G. (Lemp) systems of control, but the latest vehicles are being fitted with the RZM type. Moreover, six other cars of the same general design powered by 300 b.h.p. Motorenwerke Mannheim (MWM) and 330 b.h.p. Mercedes-Benz engines were introduced in 1934, and others with the double-crankshaft 420 b.h.p. M.A.N. engine. Actually, 34 engines of the last-named type were contemplated but most of these will be superseded by the new M.A.N. single-crankshaft 420 b.h.p. engine, and other modifications to the programme have been made. Two of the M.A.N.-engined cars are to have Voith hydraulic transmission, and some of the engines to be used in conjunction with electric transmission are to be supercharged up to a continuous output of 560 b.h.p.

The weight has varied in see-saw fashion, from 50 tonnes down to 41½ tonnes, and then up to 48 tonnes in

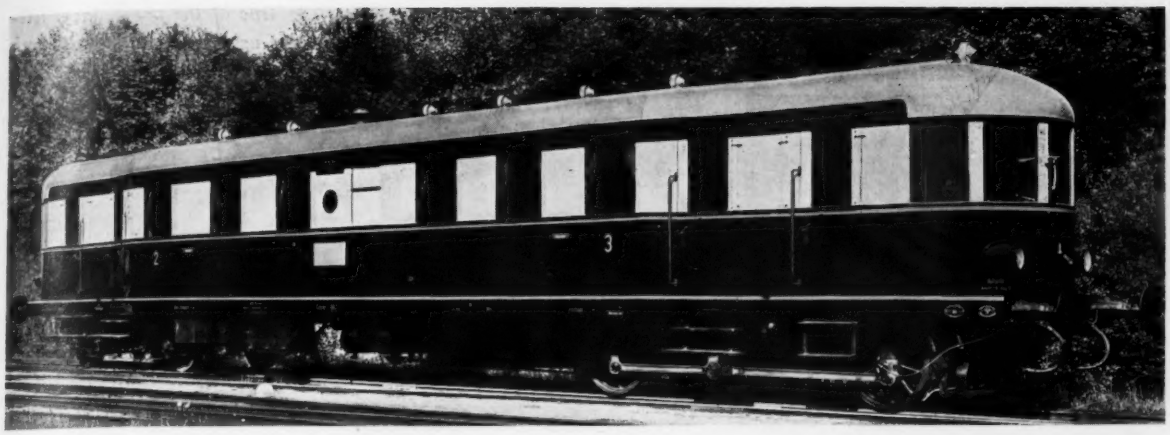


Arrangement of 150 *b.h.p. M.A.N. engine and Mylius transmission on a subframe. Four-wheeled cars to which these assemblies are fitted are shown in the background*

some of the latest cars with 16 second class and 45 third class seats. The Maybach-engined cars with 16 second class and 55 third class seats but without luggage room tare 41½ tonnes and are coupled to a driving trailer taring 21 tonnes and seating 16 second class and 59 third class passengers. The bogies, engine and traction motor arrangement, and auxiliaries are similar to those of one half of the *Flying Hamburger* twin-car sets. The body is welded up of steel sections and panel plates of 1·5 and 2 mm. thickness. Hildebrand-Knorr air brakes apply shoes to drums on the wheel centres as in the super-speed trains, and in certain cases the top speed has been raised to 68 m.p.h. The 410 b.h.p. cars have 200 kW. main generators and two 106 kW. traction motors.

Low-Powered Railcars

Apart from an experimental car of 280 b.h.p. the small diesel cars of the German State Railway are confined within the limits of 135 and 210 b.h.p. and fall within two categories, viz. diesel-mechanical bogie cars with 150, 175, and 210 b.h.p. Maybach engines, and four

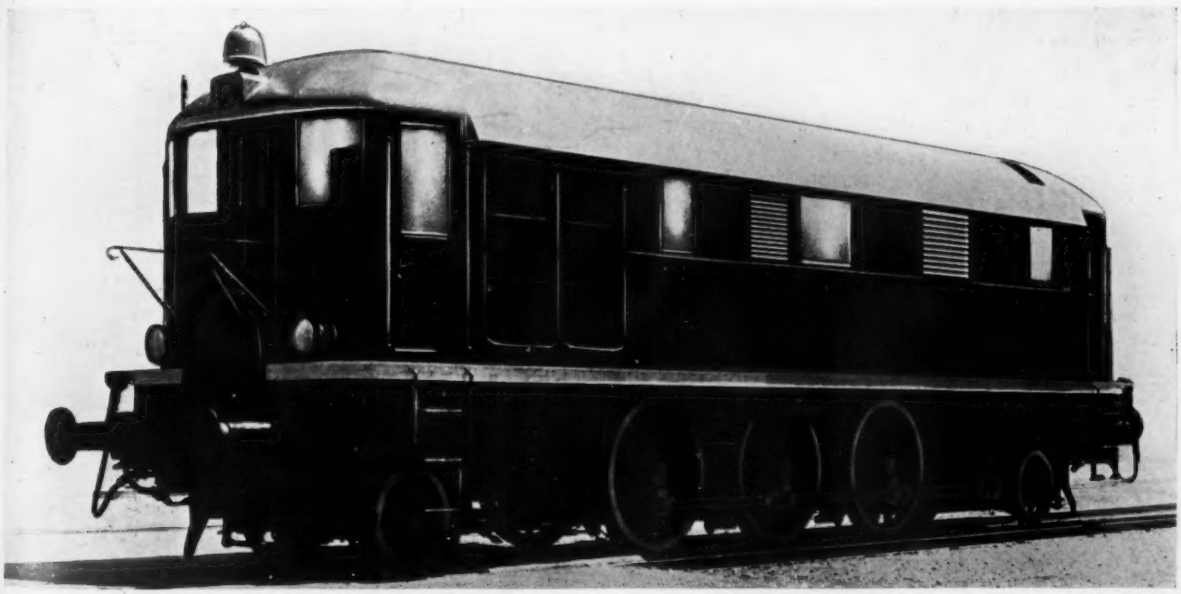


210 b.h.p. Maybach–Wumag diesel-mechanical car belonging to the Reichsbahn

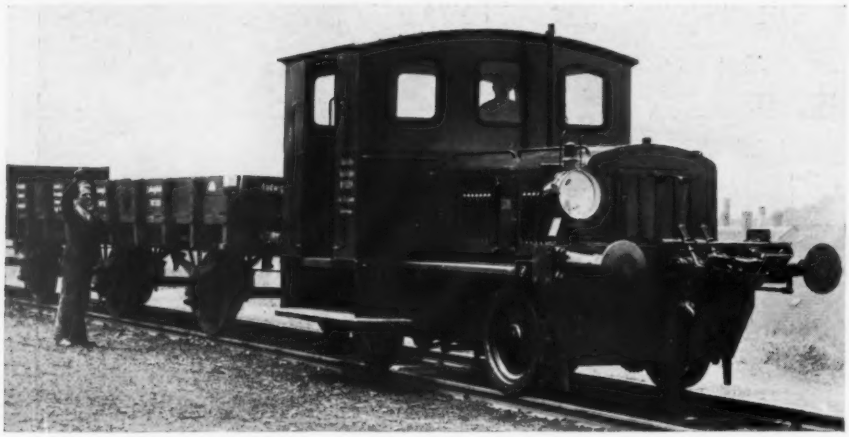
wheeled cars with Daimler and M.A.N. engines, some fitted with geared and some with electric transmission, and one or two with hydraulic systems. The first type includes the score of Maybach 150 b.h.p. cars built before 1930, and subsequent vehicles have merely been developments without any radical change in the motive power but with improved construction of the mechanical portion.

Weighing 37 to 41 tonnes, the first three Maybach 150 b.h.p. cars were put into service in 1925 in the Mainz and Schwerin districts and were of slightly different seating capacities and lengths. The third car, having 71 seats on a tare weight of 41 tonnes and having a length of 69 ft., was standardised, and by 1930 there were 20 in service, of which three were solely for light goods and parcels traffic and normally hauled two or three wagons, the tare weight of the car itself being 39 tonnes. Five further cars were acquired in 1931, but when another order for 20 vehicles was placed in 1932 the engine was speeded up from 1,300 to 1,400 r.p.m. and the output increased to 175 b.h.p. and the top speed raised from 40 to 50 m.p.h. The latest lightweight steel construction was embodied, bringing the tare weight to 29·5 tonnes, and rounded ends were substituted, the final result being a greatly improved all-round capacity. Since then the output of all the older cars has been raised to 175 b.h.p. The 210 b.h.p. cars are virtually the same vehicle with a larger engine, and have 63 seats plus luggage accommodation. They tare 30·5 tonnes and have a top speed of 50 m.p.h. There were 19 of them in service at the beginning of 1934, all with the standard Maybach geared transmission in which the final drive is by coupling rods from a central jackshaft on one bogie, but two new cars are now being tried with Trilok hydraulic transmission. Further cars with 210 and 300 b.h.p. M.A.N. engines have been fitted with Mylius and T.A.G. gear drives.

The precursors of the numerous two-axle light-weight cars were two 15·5-tonne 120 b.h.p. Daimler-Benz cars with Gebus electric transmission which were set to work in 1932. Experience with these engines showed that the continuous rating could be increased to 135 b.h.p. at



Main line locomotive with 1,400 b.h.p. supercharged M.A.N. engine and Voith hydraulic transmission which is now being tried by the German State Railway



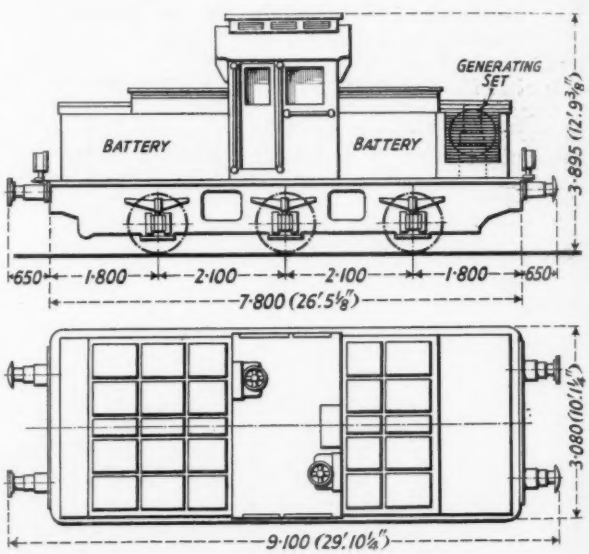
One of the many diesel loco-tractors used for light shunting work on the Reichsbahn. The unit illustrated has an engine of 25 b.h.p. and is fitted with mechanical transmission

1,700 r.p.m., and in 1933-34 the Bautzen Waggonfabrik built 20 cars of this type but with T.A.G. mechanical transmission. These cars have a tare weight of 14·5 tonnes, a top speed of 45 m.p.h., and a seating capacity of 40; they are frequently used for trailer haulage. Ten railcars with 150 b.h.p. M.A.N. engines and Brown Boveri electrical transmission also were supplied in 1934, and tare 17 tons for the same seating capacity.

Most of the more recent cars of this design have T.A.G. gearboxes, tare 15 tonnes and have a top speed of 47 m.p.h.; the standard dimensions are: wheelbase 20 ft. 4 in., length of body 36 ft. 9 in., width 10 ft., 44 seats, and 50 sq. ft. of luggage room. Mylius gearboxes are being given a trial, and three 15·8-tonne cars at work in Bavaria have Voith hydraulic drive with one converter and one coupling. Another transmission experiment is the fitting of a Trilok hydraulic drive to one of a handful of M.A.N. 150 b.h.p. cars weighing 23·5 tonnes which were built in 1927, and an engine experiment is the installation of the new Deutsche Werke, Kiel (D.W.K.) 180 b.h.p. horizontal engine beneath the floor of a car having T.A.G. drive. The engines of the M.A.N. and Daimler vertical types are all mounted on a subframe slung below the car underframe, in the manner indicated on one of the accompanying illustrations.

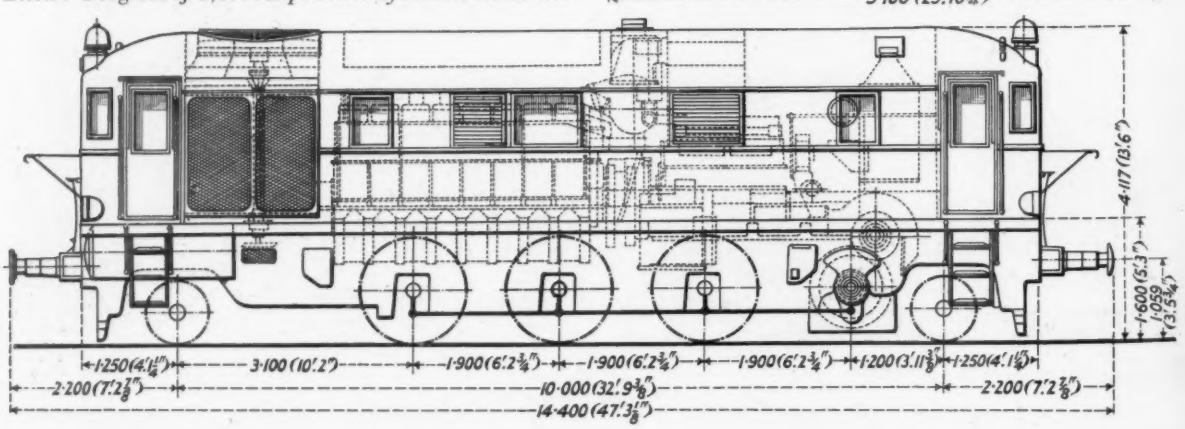
Locomotives

In contra-distinction to the remarkable development made in railcar practice, good fortune has not attended the locomotives tried by the Reichsbahn, excepting, of course, the hundreds of small loco-tractors of 20 to 80 b.h.p. and the two or three two-power locomotives. Beginning operations about 15 years ago with an apparent belief in the future of the full-power hydraulic transmissions then prevalent, e.g., the Lentz and Schumacher types, a number of locomotives in powers up to 400 b.h.p. were built, but they did not run for very far or for very long, the defects in all cases being those of the transmission. A similar fate awaited the 1,200 b.h.p. pneumatic transmission locomotive which, after years of preparation,

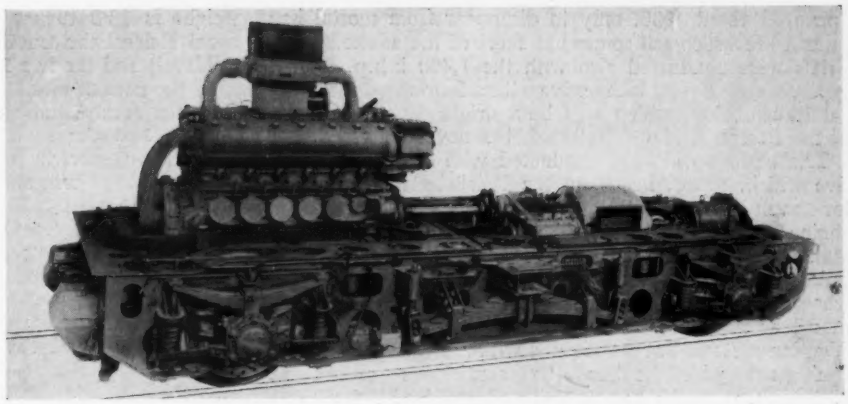


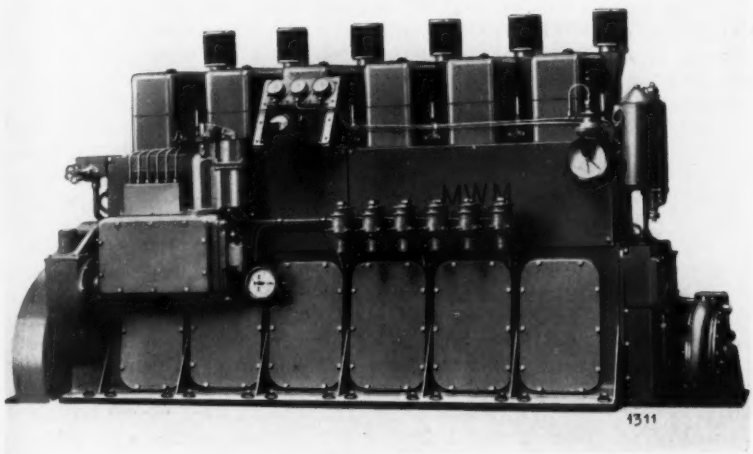
Right: Two-power diesel-battery shunting locomotive with 75 b.h.p. diesel engine and 120 kWh. battery used at the Anhalter station, Berlin

Below: Diagram of 1,400 b.h.p. diesel-hydraulic locomotive



Right: One of the triple-suspension power bogies of the new triple-car 1,200 b.h.p. diesel trains. The wheelbase is 13 ft. 10 in., and the axles run in roller bearings. The 600 b.h.p. Maybach engine is fitted with a Büchi–Brown Boveri supercharger, and the engine drives a Voith hydraulic transmission set which is mounted on the bogie also

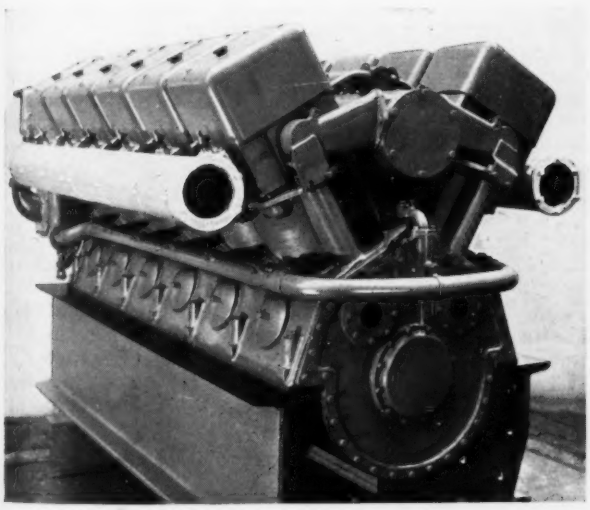


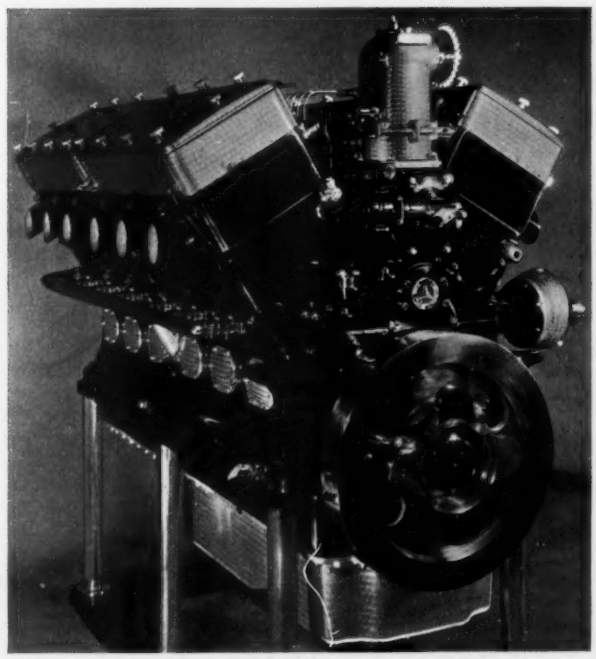


Left: One of the six-cylinder 300 b.h.p. Motorenwerke Mannheim engines. The cylinders are 200 mm. by 250 mm. and the rotational speed 1,100 r.p.m. Fuel pumps of MWM design and manufacture are fitted

Below: The new Mercedes–Benz engine developing 450 b.h.p. at 1,400 r.p.m. in 12 cylinders 165 mm. by 195 mm. on a weight of 12 lt. per b.h.p. The latest metallurgical practice is embodied in this engine

Below: The new M.A.N. 420 b.h.p. 12-cylinder, single-crankshaft engine which runs at 1,400 r.p.m. The cylinders are 175 mm. by 180 mm.





MODERN DIESEL ENGINES USED ON THE GERMAN STATE RAILWAY

appeared about 1930, only to disappear from mortal ken after a life which fell somewhat short of the allotted span. Trials were conducted also with the 1,400 b.h.p. 2-Do-2 supercharged Krupp locomotive with a four-speed mechanical transmission, which was built originally to the order of the Boston & Maine Railroad, but never delivered.

Trials are now being conducted with a 2-6-2 locomotive which, again, keeps up the Reichsbahn's reputation for novelty in locomotive work by having a supercharged engine and hydraulic transmission. Built by the Krauss-Maffei works at Munich, the locomotive in full working order scales 78 tonnes, of which 48 are on the coupled wheels. The engine is the standard M.A.N. 920 b.h.p. model as fitted in the express locomotive of the P.L.M. Algerian system, but is provided with Büchi supercharging equipment which raises the continuous output to 1,250 b.h.p. at the same rotational speed of 700 r.p.m., and the capacity for one hour to 1,400 b.h.p. The lubricating oil and circulating water are cooled in side radiators through which air is drawn by an electrically-driven fan. Power for all the auxiliary services is provided by a six-cylinder 120 b.h.p. M.A.N. engine running at 1,100 r.p.m.

A single-converter double-coupling Voith hydraulic drive is used, the torque from which is transmitted to the 55-in. wheels through side rods from the final shaft of the drive, on which are mounted the reversing bevels. The engine

25 b.h.p. two-stroke tractor on the Reichsbahn

torque is taken first through a Voith-Maurer flexible coupling to a speed-up gear with a ratio of 1 : 1·41 and then to the hydraulic portion. From zero speed up to 50 per cent. of the maximum, the converter is in operation, and from 50 to 70 per cent. the first hydraulic coupling is used, the maximum theoretical efficiencies being 82 and 98 per cent. respectively. From 70 per cent. to full speed the second coupling is used, its efficiency being 92 to 98 per cent. This drive was described in the May 17, 1935 issue of this Supplement, and some of the components of this 1,400 b.h.p. transmission were illustrated in the issue for December 27, 1935, page 1129.

The two-power locomotives previously mentioned are of two types, both with diesel-battery propulsion. The larger type built by Siemens-Schuckert, is a six-wheeled design weighing 47·5 tonnes, and is characterised by a steeple cab with the 160-cell 120 kWh. Afa battery in bonnets at each end. The 75 b.h.p. Deutz engine running at 1,100 r.p.m. is coupled to a 48 kW. generator. Each axle is driven by a 50 kW. 290-volt motor, which give combined tractive efforts of 22,300 lb. at starting and 8,600 lb. for one hour at 7·5 m.p.h. The top speed is 40 m.p.h. The second type really belongs to the loco-tractor range, for the engine is of only 20 b.h.p. capacity, the 92-cell battery of 19 kWh. capacity, and the total weight is 13·3 tonnes. It is built on the lines of the usual Reichsbahn tractor with low cab (8 ft. 9 in. above rail level) and the two 20 kW. motors drive the two axles.

Of the normal diesel loco-tractor the German State Railway has several hundred, mostly with mechanical transmission and the final drive through chains, but some units have electric transmission. Petrol-engined and electric battery tractors are used also, but the main diesel types are the Deutz 65 b.h.p.; M.A.N. 60 and 85 b.h.p.; M.W.M. 62 b.h.p.; Daimler-Benz 60 b.h.p.; Orenstein & Koppel 70 b.h.p.; and Arn. Jung 22 and 50 b.h.p. Two-stroke single and three cylinder engines are used in the Jung machines. A special numbering system has been evolved for these tractors and enables the type of motive power and the approximate engine power to be obtained at a glance. On the number plate is a large K, which stands for Kleinlokomotiv (little locomotive). The small numbers which follow indicate the type of prime mover or power supply, *b* representing benzol (petrol); *o*, heavy oil; *d*, dampf (steam); *s*, speicher (battery); and *os*, oil-battery. The numbers 0001-3999 are reserved for units below 40 b.h.p. and those of 4,000 and upwards for machines above 40 b.h.p.

Diesel Engines

The variety of engines used by the Reichsbahn, more particularly in the railcar field, is due in part to the fact that the pioneering and experimental work has been carried out in the interests of the German car and engine builders as well as in the railway's own interest, and more types of equipment are to be found than are strictly necessary for efficient operation and orderly progress. The engines used include straight-six, 12-cylinder V, 12-cylinder V with double crankshaft, and 8-cylinder horizontal models, and an 18-cylinder 6-star Michel engine of 210 b.h.p. is to be installed in a railcar. It is worth noting that the Reichsbahn appears to have no use for the 8-cylinder vertical engine.

Of all makes the Maybach is the most widely used, and the successful development of this engine, especially the 410 b.h.p. size, has resulted largely from the policy laid down for the Reichsbahn of shouldering the burden of working difficulties in order to serve German industry as a whole. After the 150, 175, 210, and 410 Maybach models, come the various sizes of M.A.N. engine, 150, 210, 280, and 420 b.h.p. The last-named is the double crankshaft design in which the 12 cylinders are arranged in two banks and the armature shaft of the main generator driven through gears. Büchi supercharging has been applied to certain of these engines and has raised the continuous output to 560 b.h.p., but the type has been given up for new construction and replaced by a new 12-cylinder V design with the same size of cylinders (175 mm. by 180 mm., or 6·9 in. by 7·1 in.) and a single crankshaft. Mercedes-Benz 12-cylinder engines of 330 and 450 b.h.p. are used, and for the smaller cars the 135 b.h.p. Daimler-Benz engine is the most numerous.

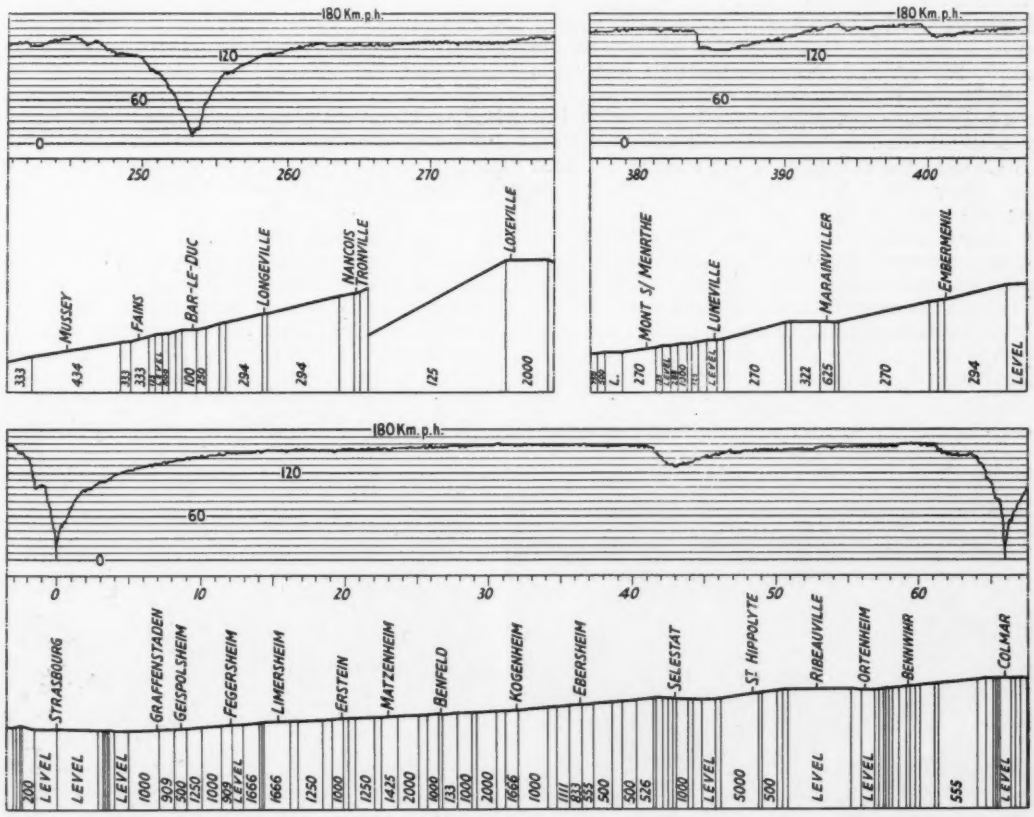
Büchi supercharging has been applied also to the 410 b.h.p. Maybach engine, raising its output to 600 b.h.p. at 1,400 r.p.m. This supercharging equipment can be seen in the illustration of one of the power bogies from a three-car streamlined train reproduced with this article. The exhaust-gas Brown Boveri turbo-blower runs at 13,000 r.p.m. at full load and has a corresponding capacity of 1,970 cu. ft. of air a minute at 5·9 lb. per sq. in. By the incorporation of this equipment the brake m.e.p. at full load has been increased from 91 to 117 lb. per sq. in. The water cooling equipment is lighter, as the number of heat units taken away by the supercharging air is considerable. For the addition of 660 lb. weight the engine output has been increased by 190 b.h.p. and the unit weight reduced from 11 to 8·85 lb. per b.h.p.

THE RENAULT RECORD RUN IN FRANCE

A top speed of 103·7 m.p.h. and an acceleration from rest to 97 m.p.h. in 5·8 miles of level track were features of a super-speed run conducted by the Ch. de fer de l'Est

500 b.h.p. 40-seater Etat Renault car which made the record run

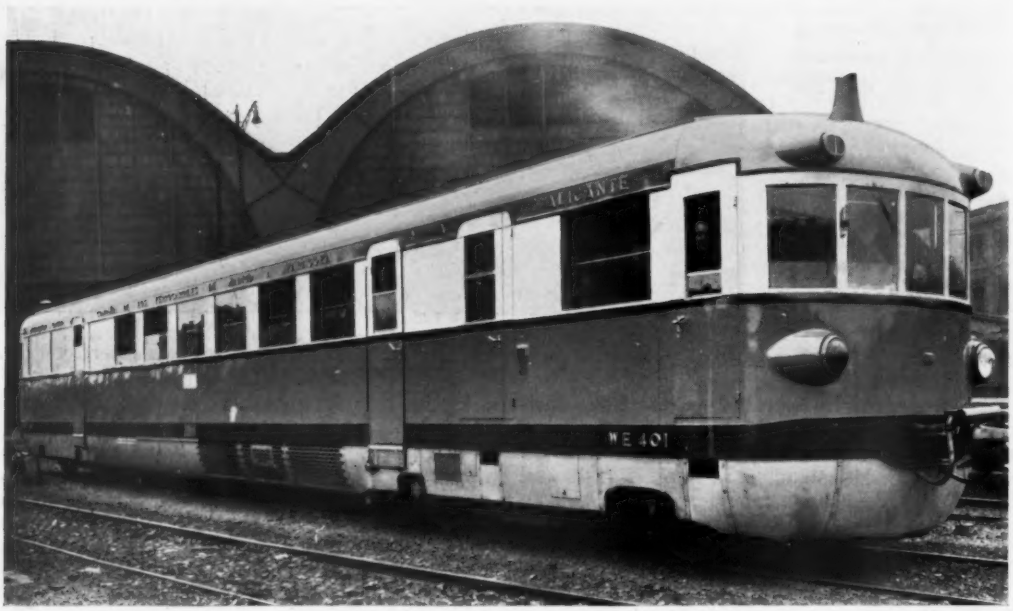
ON December 4, 1935 was made what has fair claims to be regarded as the fastest diesel run in history. One of the new Est double-bogie Renault railcars, with one 16-cylinder 500 b.h.p. engine of the type described in the issue of this Supplement for November 29, 1934, ran over the Est and Alsace-Lorraine systems from Paris to Nancy, Strasbourg, Mulhouse, Belfort, Chaumont and back to Paris, a total distance of 689 miles, in 515 min. including 24 min. 25 sec. standing at booked stops and a 3 min. signal stop. Allowing for booked stops and all out-of-course delays the net running time was 482 min., giving an average of 85·5 m.p.h. Booked stops were made at Nancy (4 min. 50 sec.); Strasbourg (8 min. 30 sec.); Colmar (1 min.); Mulhouse (5 min. 45 sec.); Belfort (3 min. 10 sec.); and Chaumont (1 min. 10 sec.), and in the remaining time of 490½ min. were included a 3 min. stop for signals at Reding; p.w. slacks from 94 to 62 m.p.h., from 90 to 75 m.p.h., from 90 to 25 m.p.h., and from 84 to 27 m.p.h.; signal slacks from 83 to 7 m.p.h. at Bar-le-Duc, and from 81 to 50 m.p.h., and the normal service slack to 50 m.p.h. at Chalons. The maximum speed was 167 km.p.h. (103·7 m.p.h.), and 100 m.p.h. was attained on ten occasions, the most notable being 100·4 m.p.h. when running up a grade of 1 in 270, and the maintenance of 98-100 m.p.h. over 3·9 miles up 1 in 500-1,000 grades. Three interesting portions of the speed recorder chart are reproduced on this page.



Portions of the chart taken from the Flaman recorder on the occasion of the Renault run

RAILCAR TRACTION ON THE M.Z.A.

Double-bogie cars with good accelerative powers are now operating services out of Madrid

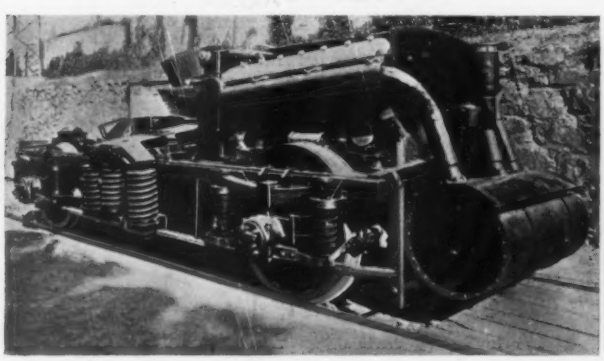


New 410 b.h.p. M.Z.A. Maybach-engined railcar in Barcelona station

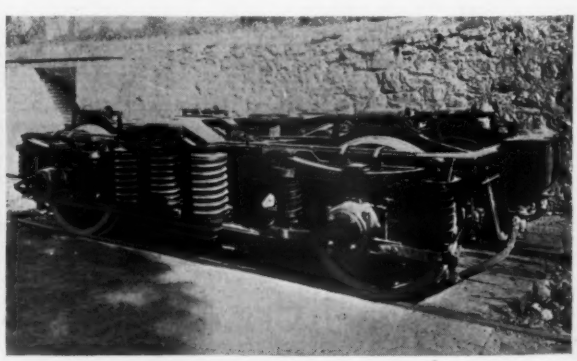
A DIESELISATION programme comprising the acquisition of 24 railcars is in course of realisation on the Madrid, Saragossa & Alicante Railway under the personal supervision of Señor Don Emilio Santiago, Sub-Directore of the company. With the inauguration last month of a diesel car service on the 125-mile line from Madrid to Cuenca, the first part of the scheme has been completed. Four 410 b.h.p. Maybach-engined double-bogie cars are now at work and four driving trailers are being built to work in conjunction with them or with certain other cars now under construction.

Built by the Compañia Auxiliar de Ferrocarriles, Beasain, the cars incorporate Brown-Boveri electric transmission with servo field rheostat control. The standard 410 b.h.p. 12-cylinder Maybach engine and d.c. generator are mounted directly on one bogie; two nose suspended traction motors are located on the other bogie, and drive the 920 mm. (36-in.) wheels through gears having a ratio of 3·58 to 1. All the axles are carried on S.K.F. roller bearings, and the air brake actuates shoes applied to drums secured to the wheel centres.

The bodies of the cars are of welded steel, and were built at the Beasain works, but the bogies were fabricated by the Waggonfabrik Uerdingen, and embody that firm's patent one-piece wheel. The bogie frame structures are entirely welded, with main side members and end transoms of box form. The engine is mounted on a welded steel subframe and the generator on another; these two subframes are articulated together and are supported on the bogie frame structure at three points through rubber blocks. The interior is divided into two compartments seating 64 third class and 16 special class passengers respectively. Lavatory and luggage accommodation is provided. The third class seats have leather covering and leather half way up the backs. The ventilators in the roof are opened by handles on the side panels between



Bogie with 410 b.h.p. engine and generator



Driving bogie with two electric traction motors

the windows, and each handle controls two ventilators. All the side windows are of the drop type, operated by turning a handle below the waist-rail. The 16 special class seats are upholstered and are mounted on tubular frames of chromium-plated steel. This material is used also for the interior fittings generally, except the window frames which are of aluminium alloy. Features of the special class saloon are detachable tables between the seats and indirect electric lighting.

Idling at 800 r.p.m., the Maybach engine is arranged to operate at three speeds under load, viz., 950, 1,150, and 1,400 r.p.m. The firing order is 1-2-4-6-5-3 for each bank of cylinders. Careful tests on the M.Z.A. have confirmed the maker's guaranteed fuel consumption of 200 gr. (0·44 lb.) per b.h.p. hr. at full load and 182 gr. (0·4 lb.) at three-quarter load. A good fuel consumption is of greater importance in Spain than in most other countries for the price of oil is 365 pesetas a tonne (£10 5s. per ton at present exchange rates). The engine exhaust is taken up past the driver's seat to the roof, and the duct is well lagged with asbestos. The controls and fittings on the driving dashboard do not include any device to indicate the lubricating oil pressure, but it may be found in future that some such fitting is necessary, for although the engine is arranged to shut down if the oil pressure falls, it may stop from a number of causes without the driver being given any guidance as to what is wrong. The fuel tanks are cylindrical in form and are slung from the roof of the engine room; they have the large capacity (combined) of 900 litres (200 gal.).

Multiple-unit control and a dead-man handle are incorporated. The latter is of the Brown-Boveri speed type in which the delay is inversely proportional to the speed, the cutting off of power and the application of the brake being almost instantaneous at high speeds. Three handles are provided for the dead-man device, one on the controller handle for normal driving conditions, and one at each side for use during shunting movements. At each end of the car are two electric headlamps one with clear glass and the other with red; in either direction of running the lighted headlamp is clear and the tail lamp red. The cars and driving trailers are fitted with Scharfenberg couplers for the instantaneous and simultaneous mechanical, electric, and pneumatic coupling of the two vehicles. These Maybach cars tare 41·5 tonnes and have a top service speed of 110 km.p.h. (68½ m.p.h.), which velocity they can reach in 110 sec. from a start on the level, through the provision of 10 b.h.p. per ton of tare weight.

Two views of the welded steel body of the 410 b.h.p. railcar during construction in the factory of the C.A.F. Beasain.

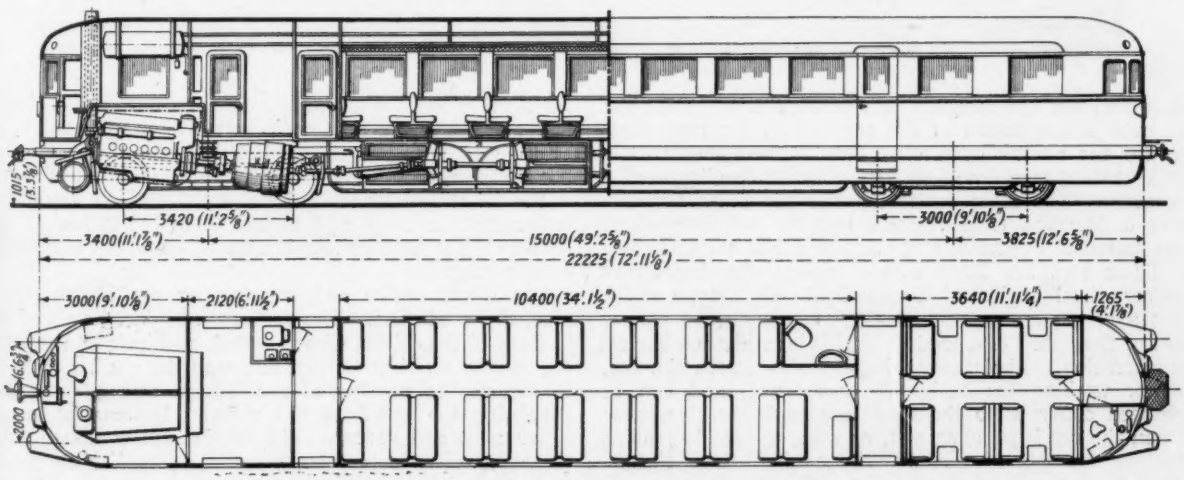


Diagram of 410 b.h.p. Maybach-engined car on the M.Z.A. Railway

Light-weight Diesel Cars in Switzerland

New design for solo operation

THE first trials of one of the two diesel railcars ordered in 1934 by the Swiss Federal Railways and described in the issue of this Supplement for September 7 of that year, took place in December. The general appearance of the car is very similar to that of the Red Arrow electric railcars introduced earlier in 1935 (see *Electric Railway Traction Supplement*, July 27, 1934, and March 8, 1935), other points of similarity being the maximum speed of 125 km.p.h. (78 m.p.h.) and the fact that the cars are designed to run without trailers. The internal arrangements of the car are on the same lines as for the electric cars, viz., two compartments with a total seating capacity of 66, space for 30 standing, and a lavatory. The main contractor was the Swiss Locomotive & Machine Works, which had the collaboration of the technical department of the Swiss Federal Railways.

These cars are fitted with a six-cylinder four-stroke Sulzer diesel engine of a new light-weight type which has a continuous output of 290 b.h.p. at 1,200 r.p.m., and a five-speed oil-operated SLM-Winterthur mechanical transmission. The starting battery also serves the d.c. motor working the brake air compressor, and can be charged either when the diesel engine is working, even when the car is standing still, or when the car is running without the engine working. The standard Swiss Federal Railways electric lighting system is provided, and is independent from the starting battery. The crankcase and cylinder blocks of the engine are of cast steel and welded plate construction, with cast iron cylinder covers and liners. The overload rating is 320 b.h.p. at 1,200 r.p.m.

The braking and heating arrangements are entirely different from those of the electric railcars. An air brake with 16 blocks is fitted, with a cylinder for each bogie. Approximately 85 per cent. of the weight of the empty car is braked at a pressure of 3·5 atm. (50 lb. per sq. in.), and about 120 per cent. at 5 atm. (73 lb. per sq. in.). The car is equipped with a hot-air heating system. In the electric railcars the air was electrically heated, whereas in the diesel cars the air is drawn by a fan into a cylinder under the car body and heated there by means of oil burners. The interior temperature of the car is automatically regulated.

The diesel engine and transmission are electro-pneumatically controlled. The controls are placed on a desk in front of the driver, who is seated, and include a reversing switch, a switch to start and stop the engine, another to control the number of revolutions, and a controller regulating the speed of the vehicle, besides the usual instruments and gauges. The railcars are equipped with the standard automatic track circuit system of the Swiss Federal Railways. The compressor, starting and light-

Three views of the new 290 b.h.p. diesel-mechanical railcar of the Swiss Federal Railways

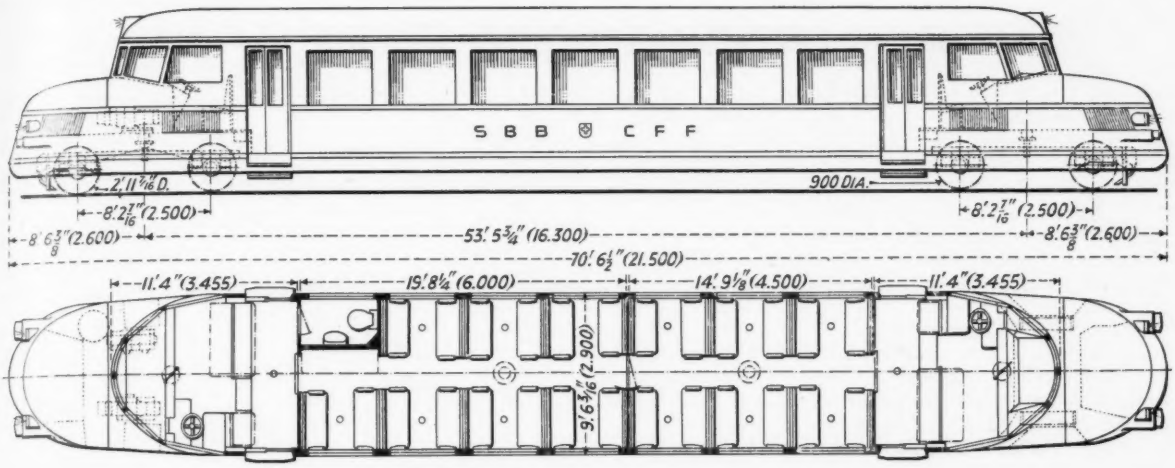


Diagram of 290 b.h.p. single-engine diesel-mechanical car, Swiss Federal Railways

ing batteries and other apparatus are fitted under a bonnet at one end of the car, over the driving bogie.

For a start, the two cars will be placed in service on the Lausanne-Payerne-Lyss-Solothurn line, and will run on alternate days, one car always remaining in reserve at Berne. The day's work will commence at Payerne at 5.46 a.m. with a run to Lyss, after which the car will proceed to Lausanne, back to Lyss and on to Solothurn, returning to Lausanne and finally back to Lyss again, proceeding thence to Berne and remaining there the following day. The second car will leave Berne in the evening and take the last service from Lyss to

290 b.h.p. Sulzer light-weight engine used in conjunction with SLM-Winterthur oil-operated hydraulic transmission

Payerne, arriving at 10.33 p.m., and beginning service from there the next morning as outlined above. For the period from January 1 to May 14, the cars are scheduled to run some 540 km. (335 miles) a day on weekdays and 560 km. (347 miles) on Sundays, when an additional trip from Lyss to Büren and back is made in the evening. The cars will stop at all stations, and the average speed scheduled is 49 km.p.h. (30·5 m.p.h.) from Lausanne to Lyss, and 47 km.p.h. (29·8 m.p.h.) in the opposite direction. The steam trains at present in service on this line do the run at an average speed of 29 to 32·5 km.p.h. (18 to 20 m.p.h.).

MYLIUS GEARS.—There are at the present time 450 gearboxes of Mylius design in use on railcars in half-a-dozen European countries. Of this number, 320 are at work in Germany. The aggregate horse-power transmitted by these gearboxes is 55,000.

HIGH-SPEED POLISH SERVICES.—Diesel railcars of the double-bogie type are now running between Warsaw and Lodz and Warsaw and Katowice. They are booked to make the journeys on fast schedules.

MORE SPANISH RAILCAR SERVICES.—The diesel service on the Northern Railway of Spain from Madrid to Segovia has been extended to Zamora. The car leaves Zamora in the morning and returns from Madrid in the evening, making a total daily mileage of 285. The Madrid, Saragossa & Alicante Railway inaugurated in December a diesel service between Madrid and Cuenca, with the new 410 b.h.p. Maybach cars.

DIESEL-ELECTRIC UNIT FOR MIXED SERVICE.—The Chicago, Burlington & Quincy Railroad has placed an order with the Cummins Engine Company, of Columbus, for one dual power-plant diesel-electric locomotive of 900 b.h.p. This locomotive is to be fitted with G.E.C. electrical equipment, and will work on mixed branch line service over Fort Worth and Denver City lines.

GIRLING-CONSOLIDATED RAILCAR BRAKES.—On page 1119 of the December 27 issue of the *Diesel Railway Traction Supplement* the 11 railcars for the Entre Rios Railway were mentioned as being fitted with Lockheed brakes. Actually, the brakes are of the Girling-Consolidated type, manufactured by G. D. Peters & Co. Ltd., Slough, and the same system is being applied to the two railcars for the Buenos Ayres Pacific Railway and the six cars for the Central Argentine Railway which are being built by the Birmingham Railway Carriage & Wagon Co. Ltd.

DIESEL LOCOMOTIVE FOR THE AIR MINISTRY.—Gleniffer Engines Limited has received an order for an 8-cylinder 160 b.h.p. diesel engine, for use in a shunting locomotive which Andrew Barclay & Co. Ltd. is to construct for the Air Ministry.

LETTER TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

3, Central Buildings,
Westminster, S.W.1
January 16, 1936.

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—In the *Diesel Railway Traction Supplement* for November 1, 1935, is the synopsis of a series of very interesting lectures by Professor A. Lipetz on diesel traction.

His method of predetermining the economy of diesel traction over steam *for given fuel oil and coal prices* is probably the simplest and clearest so far proposed. His formula (3), page 750, can, however, be made even more practical by slight modification.

I think it more rational to keep the first cost and utilisation (working hours) of steam locomotives in this formula,

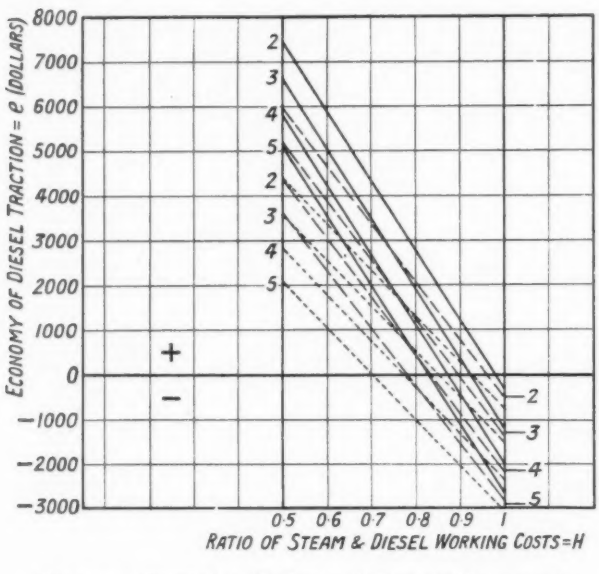


Diagram illustrating Professor Lomonossoff's remarks on the economy of diesel traction

as these values are well established, which is not the case for diesel units. Furthermore, let us call the ratio of cost of the working locomotive hour for diesel and steam traction

$$\frac{C_d}{C_s} = H$$

and the corresponding first cost

$$\frac{P_d}{P_s} = L$$

Then Professor Lipetz's formula (3), giving the saving due to one diesel locomotive, assumes the form

$$e = K_r\,(1 - H) - a\,(L - K) \qquad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

where

$$r = U_s C_s$$

expresses the monthly operating cost of one steam locomotive and

$$a = \frac{P_s f}{1{,}200}$$

the corresponding capital expenditure.

Formula (4) seems precise and very simple, but the values used in it by Professor Lipetz are open to discussion. He assumes the ratio of working hours per month for diesel and steam locomotives as $K = 1{\cdot}25$. As a mean value this cannot be disputed; in actual fact it varies between $1{\cdot}0$ and $1{\cdot}5$.

The figure which is most open to question is Professor Lipetz's value for steam locomotive utilisation (working hours) which he gives as

$$U_s = \frac{333{\cdot}3}{1{\cdot}25} = 267 \text{ hours a month,}$$

i.e., less than nine hours a day. Literature on this subject, as well as my own observations, indicate that in the United States this figure is normally higher than 12, *i.e.*, 360 hours a month. If, however, owing to decreased traffic and the consequent excess of locomotives, U_s is at the present time really 267, then new diesel locomotives would certainly not be built to be utilised so inefficiently and K would therefore be not $1{\cdot}25$, but approximately $2{\cdot}0$. But it is advisable to consider normal conditions and U_s will therefore be assumed as 360 hours a month.

To my knowledge there is no railway on which fuel costs exceed 50 per cent. of the total locomotive operating costs. If this figure is assumed for New England, which Professor Lipetz gives as an example for the highest cost of coal, then

$$C_s = \frac{14{\cdot}64}{0{\cdot}5} = \$29{\cdot}28 \text{ per hour.}$$

$$r = U_s C_s = \$10{,}500 \text{ per month.}$$

$$a = \frac{80{,}000}{100} = \$800 \text{ per month.}$$

For these values of a and r, formula (4) is expressed as

$$e = 11{,}300\,K - 10{,}500\,KH - 800\,L \qquad \ldots\ldots (5)$$

Graphically, e as a function of H takes the form of a sloping straight line. In the attached figure this function is given for $K = 1$ in dotted lines, for $K = 1{\cdot}25$ in broken lines and for $K = 1{\cdot}5$ in solid lines. The figures on the lines give the corresponding value of L.

This figure shows that even for conditions most favourable for diesel traction ($L = 2$, $K = 1{\cdot}5$) it can give no saving if $H > 0{\cdot}98$. It also shows that even for the most unfavourable conditions ($L = 5$, $K = 1$) diesel traction will give a saving if $H < 0{\cdot}70$. In other words, in the solution of the problem of the economic advantage of diesel traction, it is H, *i.e.*, the ratio of operating costs for diesel and steam traction, which is the deciding factor. For New England, which Professor Lipetz considers a very favourable district for diesel traction, he assumes

$$C_s - C_d = C_s\,(1 - H) = \$2{\cdot}64$$

which, with $C_s = 29{\cdot}28$, corresponds to $H = 0{\cdot}91$. For different Russian lines, however, H varies between $0{\cdot}52$ and $0{\cdot}97$, depending on the ratio of fuel prices, size of crews and the quality of the water. This last is of particular importance.

In contradiction to Professor Lipetz, ten years' Russian practice has firmly established that in districts with bad water, diesel locomotive maintenance is considerably cheaper than for steam.

Regarding the ratio of first cost, Professor Lipetz gives $L = 4{\cdot}2$ for main line locomotives. This is true for America as long as large diesel locomotives are produced only experimentally, whereas corresponding steam locomotives are produced in quantity. When diesel locomotives are also produced in quantity this figure will probably be about 2.

Yours faithfully,

G. LOMONOSSOFF